THE RAILWAY REVIEW

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CLEANING WATER PIPES.—Some time ago the French military authorities discovered that the water pipes to a certain citadel were badly furred, their inside diameter being reduced from 2¾ to 1½ in. After removing the pipes an attempt was made to clean them by immersion in a bath of hydro-chloric acid, but without success. It was then decided to try the effect of heating the pipes. To this end they were stacked loosely in a pile and a wood fire lighted around them. After cooling it was found that the furring could easily be knocked out, and of 137 lengths of piping only six were injured in the process.

WELDING LARGE AND SMALL PIECES OF METAL.—In welding large and small pieces together, especially of different metals, is is not necessary to heat both pieces to the same degree of temperature, says Engineering Review. In case of putting a small piece of steel upon a large piece of iron, as happens when a steel bearing is to be put on an end of an iron shafting, the latter can be heated to the ordinary welding heat, while the steel need only be heated bright yellow. This is taken advantage of many times in order to weld together cast steel and wrought iron, especially in the case of cutting tools,where it is necessary that the steel shall not lose any degree of fineness through being overheated. In the case above mentioned of facing the end of a shaft with steel separate fires can be used for heating the two pieces—a large fire for heating the end of the shaft, and, after it is nearly hot, the steel can be heated in a small fire. When nearly to a yellow heat it may be transferred to the larger fire and placed in position upon the end of the shaft without removing the latter from the fire. A few blows from a large sledge hammer, or from a ram suspended from some point overhead, will unite the two pieces of metal, after which they may be removed from the fire and finished up in the usual manner by hammering or swagging down to the original diameter of the shaft. In uniting steel to the end of the shaft, the latter is upset neceesarily to a certain degree, and the increase in diameter must be reduced by swagging, as above noted.

ANOTHER OCEAN RECORD.—A dispatch from New York dated June 5, gives an account of another fast trip of the American line steamship St. Paul in which previons time was broken by one hour and forty-two minutes between Southampton and New York. The best previous record, held by the steamship New York, which is also an American liner, was 6 days 7 hours and 14 minutes. This record was made on the trip which the New York ended September 15, 1894, by which she reduced her own record of 6 days 8 hours and 38 minutes, which had supplanted the record made by the steamship Paris of 6 days 9 hours and 37 minutes. The St. Paul's best previous time between the two points was 6 days 9 hours and 15 minutes, made May 15 last. The distance covered by the St. Paul was 3,113.7 knots. The St. Paul's runs by days were: 487.8, 521.9, 521.7, 513, 508.9, 518.9 On the biggest day's run the vessel averaged 21.3 knots an hour. On this day the ship's screws made 90.3 revolutions a minute. The average steam pressure during the entire trip was 200 lbs. to the square inch. An average of 310 tons of coal were burned each day. The St. Paul carried a crew of 400 men. Of this number 168 were in the engineer's department. The trip was made without any particular incident. The St. Paul left Southampton at noon May 30, passing the Needles at 1:35. The weather on the first and second days out was exceedingly good, the sea was smooth and on the second day a run of 521.9 knots was made, which was the fastest day's run of the trip. The remainder of the voyage was made on an average of 514 knots a day. A health officer went down to the narrows and cleared the ship, and she was then allowed to proceed direct to her pier without stopping at quarantine. At exactly ten minutes past four o'clock the vessel came up to her dock, and was officially declared the possessor of the newest record. The St. Paul was built by the Cramps of Philadelphia. She was launched April 10 of last year. She was built on the same plan as the St. Louis, of which she is a sister ship.

FRICTION OF MACHINE BEARINGS.—Why is it that the friction of machine bearings like the efficiency of non-expansive steam pumps, does not declare itself? We have roller bearings, ball bearings, shell bearings, dry and self oiling bearings, but they appear and are discussed without co-efficients of resistance. One cannot form any useful idea of the merits of a ball or other bearing except by comparison. If the co-efficient of a common solid bearing is 0.05, and with rollers or balls is 0.02, we know there is a gain of 3 per cent, qualified by the relative first cost and maintenance of the two. We speak of steam engines by a measure of the pounds of water or steam consumed; of the efficiency of pumps by foot pounds for each 100 lbs. of coal; in percentage of the efficiency or losses by resistance in dynamos and motors; but not of the transmitting value of machine bearings. There is a common idea among some people that a great part of the power transmitted through bearings is lost by friction, whereas if the real losses were known it would save a great deal of effort uselessly expended in inventing rollers and balls to evade such loss in cases where the refinement costs more than it comes to. A roller or ball bearing should always be compared with a solid one of equal cost, that is one of hard materials, carefully fitted, a ground shell of hardened steel for example and if this were done the difference, in so far as frictional resistance is concerned, would nearly disappear, or at least would lead to a new estimate of such difference.—[Cassier's Magazine.]

GAS MOTORS FOR WATER WORKS.—Gas motors for pumping water are finding favor in Germany, according to "Kuhlow's German Trade Review," and at a late congress of German engineers, at Cologne, Mr. Mansel presented some statistics on this head. Among the primary advantages claimed for gas motors are economy of space, as compared with steam engines, and a great saving in the production of motive power. By the use of petroleum water can be pumped in places where steam hydraulic motors can not be employed and gas works do not exist. The use of gas motors also adapts itself advantageously to the working methods of a gas plant, as this motive power can be utilized during the day time when there is little or no demand for the gas as an illuminant. Germany was the first country to adopt gas as a motive power in pumping water. Gas motors, for this purpose, were installed at Duereu and Quedlinburg in 1884; at Coblenz and Rothwell in 1886; at Fuerth and Peine in 1887, and at Muenster and Carlsruhe in 1888. In some of these plants the gas motors are used with steam engines to supply any emergency demand. The following table shows the results obtained by gas motors in different water works, these works being arranged according to date of erection. The last two plants show a material improvement in the utilization of gas. The motors used at Muenster have an efficiency of 912,950 ft.-lbs. per pound of fuel used. As an average there was used at this plant, in 10 hours, 170 lbs. of coke and 400 lbs. of anthracite coal for producing gas. A steam engine would have consumed three times this amount of fuel for the same work. At Rothenburg,where the motors are run with gasoline, the efficiency is 1,603,750 ft.-lbs. per pound of gasoline. At Hohenstein, petroleum motors give an efficiency of 1,724,000 ft.-lbs. per pound of petroleum.

Cities.	No. of motors.	H. P.	Ft.-lbs. produced per cu. ft. of gas used.
Duereu	2	40	46,565
Quedlinburg	2	15	49,258
Coblenz	3	40	54,071
Fuerth	2	40	54,071
Carlsruhe	2	50	53,047
Kettwig	1	15	47,313
Einbeck	2	10	48,231
Bingen	2	12	52,228
Goettingen	1	10	52,676
Meissen	2	50	70,460
Constanz	1	10	71,276

SPEEDING MACHINE TOOLS.—There is now a tendency in many directions to speed up the machines in railway repair shops in order to increase the output of the works, and some phenomenal records have been made in this direction. This is being done in some cases in a perfectly straightforward way by putting larger pulleys on the countershaft or increasing speed between the countershaft and the tools. Others are making a great improvement by speeding up the quick return of all reciprocating machines. Some are combining these schemes until the shops have gained a semblance of life to which formerly they were strangers. It is related of a foreman who did not wish or dare to be frank with his men that a plan was recently arranged for the speeding up of the main shafts of his shops with the object of obtaining more rapid work in the hope that the men would not notice the change, but would work right along in ignorance of the increased output. This serves to illustrate a method of shop regulation for which foundation in fact exits to a greater or less extent in some shop. A good method successfully followed in several shops is for the foremen to set the pace for the men on each machine.—[Engineering Review.

INFLAMMABILITY OF CHARRED WOOD.—Concerning the much-discussed question whether wood, charred by long continued contact with hot steam pipes, and thus brought into a state in which even a slight touch will reduce it to powder, will ignite from any cause except actual contact by spark or flame from an outside source, Mr. Edward Atkinson, president of the widely known Boston Manufacturers' Mutual Fire Insurance Company, cities an interesting example from his own experience. He says: "Having had occasion to test heat retarding substances on my own behalf, I once obtained some sections of beautifully prepared wood pulp, in slabs of 1½ inches in thickness and of a very porous quality, which are made use of in the construction of refrigerators. My purpose was to determine whether or not such slabs could be used to prevent the escape of heat from a lamp oven. I therefore raised the heat of my inner oven, which is a tight iron box, 1 inch distant on all sides from an outer case made of vulcanized and very solid wood pulp, to a little under 400 deg. F. In the center of that inner oven, isolated from any metallic contact with the walls, I placed one of these slabs and there left it, subject to heat at less than 400 F., for about one hour. I then removed the front of the outer oven and opened the door of the inner oven, letting a very quick and large supply of fresh air into the chamber in which the oxygen had probably been, in part, exhausted by subjection to the hour's heat. The slab of wood pulp had turned from pure white to dense black, having been converted into very porous charcoal. In less than a minute after the fresh air was let in it took fire and burned to ashes before my eyes. I then repeated the experiment with the same result. Four hundred degrees F. will be developed by a pressure of steam of 238 pounds er square inch, but the same carbonization ensues by lapse of time even at boiling heat or 212 deg. F." The conclusion to be drawn from this is evident.

CHEMICAL VACUUM.—Prof. Elmer Gates, director of the new Laboratory of Experimental Psychology at Washington, claims to have recently produced the first absolute chemical vacuum known to science, and from which he has created rays which exhibit strange phenomena never mentioned as being accomplished by the Roentgen rays. The method of making the absolute vacuum was so simple and apparently effective that it is worthy of notice. He took a large, thick test tube made of the hardest potash glass, whose melting point was at an extraordinary high temperature. Into this he poured, while in a liquid form, a much softer glass, whose melting point was at a comparatively low temperature. Allowing the liquid glass to cool gradually, it formed a solid mass with the tube. After attaching a suction piston to the mouth of the test tube, the whole glass was slowly heated for about thirty hours. At the end of that time the softer glass became liquid again, while the tube still remained solid. By forcing the piston outward the greater part of the molten glass was expelled. Enough was allowed to remain at the mouth of the tube to seal it by cooling in that position. Back of this stoppage there was left a space where there had never been the least quanity of gas, hence, a perfect vacuum.

A PIECE OF IRON 2,000 YEARS OLD.—S. T. Wellman, the well known metallurgist, of the Wellman-Seaver Engineering Co., Cleveland, has a portion of a round bar of iron—and a few like pieces are held in the United States—that antedates the Christion era by two or three centuries. The iron, which had been originally hammered into plates, and was deeply rusted from age, was found a few years ago by Dr. Karl Humann, in the ruins of the Temple of Artemis Leucophryne at Magnesia, Asia Minor. Dr. Humann sent it to Hallbauer in Germany and the latter made from a portion of it a memorial tablet. This was presented to Bismark in April, 1894. It bore this inscription, in German: "For you, Prince Bismark, the iron chancellor, Hermogenes forged this iron at Magnesia, 200 B. C. Humann found it in the Temple of Artemis after 2,000 years and sent it to Hallbauer, who gave it the form in which it shall bear witness that your deeds shall outlive millenia." At the time of the presentation to Bismark, Stahl and Eisen gave a photographic reproduction of the plate and an account of the discovery of the iron. The Temple of Artemis, one of the most magnificent of ancient monuments, was rebuilt about 300 B. C., though by some the date is put at 200 B. C. The metal is described as approximating steel in its composition, though closely akin to malleable iron. It was made at a low temperature and great care was necessary in the forging. It was found rather difficult to roll the pieces that were preserved as relics, these having a diameter of about ½ in. One analysis showed carbon 0 20 per cent; phosphorus, 0.016 per cent; iron, 92.71 per cent. Another gave carbon 0.23 per cent; phosphorus, 0.0223 per cent; sulphur, a trace, with no distinguishable amount of manganese or silicon. An analysis in the laboratory of Prof. Ledebur showed 1.01 per cent of slag, 0.025 per cent of phosphorus, and 0.061 per cent of carbon.

HEAVY RAILS VS. HEAVY ROLLING STOCK.—This see saw contest between rolling stock and rails would be interesting to a trackman if he were not so seriously mixed up in the fight; and he is often placed at a disadvantage, too. It frequently happens that a company purchases a number of heavy new engines and runs them over the light rails until the expense of track repairs becomes so great that it is found necessary to put down a larger rail. This is often done without any special preparations being made to receive it, even on lines whose roadbed is in poor physical condition. No effort is made to place the track in good line and surface. The old defective ties are not renewed, nor the track ballasted, and as a result the new rail (the steel rolled nowadays is of very inferior quality, by the way) soon assumes many of the kinks found in the old rail, and the blame is laid on the foreman. We believe that if the process was reversed it would prove more satisfactory in the end. The roadbed should be ballasted with a liberal depth of sand, gravel cinders or stone, and all unsound ties removed; then lay the new steel. After this is properly done is the time to buy the heavier engines, and not before. To say that the laying of a new rail of large section on unballasted roadbed is a waste of money would be stating it mildly. It is really a blunder.—[Jerry Sullivan.

MAGNETIC IRON SAND IN NEW ZEALAND.—At the spring meeting of the Iron and Steel Institute, recently held, the treatment of New Zealand magnetic iron sand formed the subject of a communication by Mr. E. Metcalf Smith,member of the house of representatives, New Zealand. The principal iron sand deposit in New Zealand extends for about 13 miles along the sea beach at New Plymouth, in the province of Taranaki. The cliffs there consist of silica sand and a rich magnetic iron sand, and the gradual disintegration of the cliffs, together with the large quantities of iron sand brought down by the river and streams draining the slope of Mont Egment, result in a deposit of almost pure iron sand on the beach, which at some points is 14 ft. deep, and reaches for a distance of three miles out to sea. This vast deposit of magnetic iron ore is in close proximity to extensive coal beds, limestone, timber for charcoal, and in fact every requirement for the manufacture of iron. By combining the iron sand with clay and forming it into bricks, and then smelting it in a blast furnace, a soft gray pig iron containing 1 per cent of titanium is obtained. the bar iron made from it containing 0.21 per

cent of titanium. The iron sand, having been smelted, is tapped into a ladle containing 20 per cent of tarred iron sand. The liquid metal melts and absorbs the iron sand, and the tar affords sufficient carbon to preserve the fluidity of the metal. When the metal thus treated is used direct for castings, there is a gain of 2 cwt. per ton instead of a loss of 3 cwt. per ton, as in re-melting pig iron. In making wrought or bar iron the tarred iron sand is added in the puddling furnace, and in making steel by the Siemens open hearth furnace it is added there, in each case to the extent of 50 per cent. By the treatment described bar iron equal to that known as BBH can be produced for £7 per ton. Manufactured wrought iron, when reduced with charcoal, has stood the extraordinary tensile stress of 52 tons per square inch. Various by-products, such as bricks, slag cement and slag blocks are obtainable from the slag, and when ground the slag forms a valuable fertilizer.

RELATIONS BETWEEN BOILERS, CYLINDERS AND WEIGHT ON DRIVING WHEELS OF LOCOMOTIVES.*

MAURICE DEMOULIN.

There exist mutual relations between the principal elements of the locomotive, namely, the adhesive weight, the volume of the cylinders, and the power of the boiler. These relations which well deserve investigation are subject between limits to important variations, depending on the working conditions or local circumstances, which make it difficult to establish exact coefficients and comparative figures.

Thus the heating surfaces and grate areas are settled chiefly by comparison with more or less satisfactory results given by similar engines of previous types. It is impossible that it should be otherwise with engines whose power cannot be worked out in horse power or any other unit which could be easily converted into a definite steam consumption.

In engines of similar types belonging to different companies considerable differences are to be found in the relations between grate area, heating surface, and volume of cylinders, and again between the steaming power of the boilers, due either to the quality of the fuel used, or to the limits allowed for the thermal efficiency, depending on industrial and commercial considerations, and on the life of the locomotive.

The steaming power depends on the absolute dimensions of the boiler, on the heating surface, and specially on the grate area, the quality of fuel burnt, and the quantity of the fuel which is burnt per unit of grate area. Also when one compares the proportions of boilers belonging to locomotives working in different countries it must not be forgotten that the absolute size of the boilers is only a general indication, and that according to custom or the quality of the fuel used, a grate of given area may be capable of developing very different powers, according to the rate of working which is in different places considered to be forcing. If it were not so, the grate area would be the most suitable basis on which to make a comparison of different locomotives from the point of view of power, but it is not the grate area, but the quantity of coal burnt on it per unit of time, which must be taken as the unit. Thus the grate of an English engine with 17.2 sq. ft., on which Cardig or Derbyshire coal is burnt in a thick bed, will be practically equal to a grate of 22.6 to 24.7 sq. ft., with a thinner layer of low grade fuel. In other words, the imimportant point is not the area of the grate, but the volume of the fuel which can be usefully carried at any time in the fire-box.

The volume of the cylinders varies with the boiler pressure, the diameter of the wheels and the tractive force which is possible with the given adhesive weight, but the formula used for calculating it contains a variable coeffi i-ent depending on the loss of pressure allowed between the boiler and the inside of the cylinder or on the normal point of cut off used at full speed.

Finally, there will be found in the accompanying table for certain known types of express engines, the ratios between grate area and heating surface, and the volume swept by the pistons per the adstroke, and the ratios of the theoretical tractive force the adhesive weights.

It will be seen how variable these coefficients are even for engines which seem to be made for the same service, burning similar fuel, and worked in a similar way. These differences are much greater when locomotives belonging to different countries, and burning fuel of different qualities are compared. Thus English locomotives which burn good coal in thick beds with a strong draft (see columns 7 to 9) have in the three examples chosen 2.22-2.29 sq. ft. of grate, per cubic foot of volume swept through by the pistons. In the American locomotives in column 11, intended to burn anthracite, the grate is very large, and has 5.32 sq. ft. per cubic foot of volume in the cylinders.

The express engine of the Belgian State Railway, column 6, intended to burn small coal of poor quality, has a grate area of 6.1 sq. ft. per cubic foet of cylinder, the largest that we have noted in express engines. The French engines occupy an intermediate position, as do the qualities of the fuel they burn, with a grate area of from 2.47 to 3.93 sq. ft. per cubic foot of cylinder, the companies which use the smallest coal having the largest grates.

The variation in the ratio between the grate area, and the adhesive weight in locomotives intended for similar services, at least in point of including speed, are strikingly shown in the last line of the table. At one end of the scale we find an English engine with .535 sq. ft. of grate per ton of adhesive weight and at the other end an American engine having the Wootten fire box with 1.105 sq. ft., and above all the Belgian State Railway locomotive with 2.06 sq. ft. Between these extremes come the French locomotives with a minimum of .70 sq. ft. for the Western Railway, and a maximum of .918 sq. ft. for the Northern Railway.

The great area per unit of adhesive weight is thus nearly four times as great in the Belgian State locomotive as in the North Eastern locomotive.

The heating surface varies less than the grate area. In the English engines which have small grates the ratio $\frac{S'}{S}$ is as high as 72 while it falls to 26.4 for the Belgian State locomotive, and to 30.9 for the American locomotive with the Wootten fire box. In the old French engines with very long tubes this ratio was even greater than in the English engines which have always had short tubes, but the tendency at present in France is to shorten the tubes and increase the area of the grate, which reduces the ratio $\frac{S'}{S}$. In the new French locomotives the ratio of the heating surface to grate area varies from 69.5 (Eastern of France Railway locomotive with Flamau boiler, and great heating surface) to 43.3 (Northern of France Railway locomotive with short tubes and large grate.)

Finally, the heating surface above a certain minimum cannot be taken as a criterion of the power of the locomotive. The engine in column 7 has only 1,034 sq. ft. of heating surface, and develops in work practically the same power as the locomotive of column 6 which has 1,342 sq. ft. Even when the grates had a smaller area the heating surfaee was made as large as the conditions of the design permitted, and when later the grate was increased, the heating surface could not usually be increased in the same proportion.

As to the ratio of the theoretical tractive force (calculated without reducing the boiler pressure by the reduction coefficient) to the adhesive weight, it is found not to vary much for engines of the same class, viz., from .23 to .28 for locomotives with four wheels coupled; for the engine with single driving axle in column 7 the ratio reaches .36; it falls exceptionally low to .19 for the engine in column 1, which has smaller cylinders than most modern locomotives. The volume of these cylinders appears to be sufficient to use the adhesion under normal circumstances, but now-a-days one prefers to increase the volume of the cylinders partly to make use at starting of a momentary increase in the coefficient of friction due to accidental circumstances or to the use of sand, and partly to be able to cut off earlier in running.

As to the single engine in column 7, it has a very high ratio because the cylinders are large and the effective weight is not great. This engine always slips on starting if the driver is not careful. This is, moreover, the case with all engines which have not coupled wheels but for which the volume of the cylinders, apparently excessive compared with the effective weight, is determined, not with a view to starting, but in order to develop at full speed practically the same power as the engines with four wheels coupled, which have a greater effective weight. Besides, one can remedy this defect of the single engines by the judicious use of the steam sand jet, which re-establishes equilibrium by increasing the friction.

The work which the locomotive has to do is itself very variable, not only because the loads it has to draw vary, but also with a train of given weight because of the irregularity of the gradients, and the alternate slowing down or acceleration required by the working conditions, or the passage of special points on the line. The variations of the steam production, which has to change from the maximum to the minimum and back again sometimes very rapidly, are provided for by the corresponding variations of the blast.

Since the boiler of a locomotive only works with forced draft, and the natural draft only produces sufficient intensity of combustion to just balance the loss of heat by radiation, it is sufficient to stop the jet of exhaust steam into the chimney on which the draft depends, in order to stop all steam production. Again, by regulating the speed of flow of this steam, or what comes to the same thing when the blast pipe is of constant size, the weight of steam ejected per unit of time, one obtains all the intermediate degrees of steam production. But this regulation occurs automatically, because the weight of the steam exhausted through the blast in a given time is proportional to the work done. This arrangement, at once so simple and so perfect, to which the locomotive owes its existence, automatically proportions the production to the consumption, and the power developed to the work required, in a more perfect manner than the most complex apparatus could do. Each stroke of the piston so to speak prepares for the following one. The system is only at fault in one case, for reasons independent of its principle: when a locomotive has to stop at the top of a long and steep bank, the the intensity of the fire, urged by the violent blast due to the vigor of the exhaust whilst running up the bank, cannot stop when the regulator is closed. The equilibrium existing till then between the requirements and the production is violently disturbed, and as the steam produced is not being used any longer the safety valves come into play.

The same thing always tends to happen even apart from difficult gradients with locomotives working normally with a strong draft like the American engines, or with those which hold at all times a large weight of fuel in their fire boxes like English engines which burn a thick bed of fuel. The use in place of coal, of petroleum or other liquid fuel injected into the fire box as required, and which presents no large mass of incandescent fuel when the regulator is closed, is, as is well known, with the addition of a by-pass for the exhaust, a complete remedy for this state of affairs.

Production and consumption are thus intimately connected in the locomotive, so much so that if in a given engine one increases very largely the steam admission, and consequently reduces its efficiency, one will nevertheless increase the maximum power which the boiler is capable of supplying, because as the pressure at the exhaust is increased the draft will be more violent. The total efficiency of the system may diminish, but the total power will increase. Having boilers of smaller proportions compared with the weight of steam delivered per unit of time, the American engines have a much larger production per square foot of heating surface than European engines, so that they can work at all speeds with the cut off at 40 to 50 p. c. These engines thus burn as much as 225 lbs. of coal per square foot of grate (1,100 kilograms per square metre) per hour, and for the same total weight are able to develop continuously a greater power than other engines. In other words, their tractive force diminishes more slowly than their speed increases. The constancy of their tractive force at all speeds depends simply on the power of producing steam when the steam pipes are capable of carrying off all the steam made. On the other hand, these engines for known reasons are decidedly less economical than the European engines, both because the expansion of the steam is too small, and because the high speed with which the products of combustion pass through the tubes does not allow them to be cooled sufficiently before they

*From the Bulletin of the International Railway Congress.

		Northern of France. (Type "Outrance" 1878.) 1	Western of France. (Bogie engine.) 2	Eastern of France. (Bogie engine.) 3	Paris-Orleans. (1889.) 4	Paris-Lyons-Mediterranean. (1882 modified.) 5	Belgian State. (1889.) 6	Great Northern. (Single drivers.) 7	Midland. (Bogie engine.) 8	North Eastern. (1894.) 9	New York Central. (Engine 999.) 10	Erie Railroad. (Wootten fire-box) 6 coupled. 11
Boiler pressure	Lbs. per sq. in.	124	156	171	185	156	145	171	160	160	190	160
Diameter of cylinders	Inches.	17·	18·1	18·5	17·3	19·7	19.7	18·1	18·1	19	19	21
Stroke of pistons	Inches.	24	26·	26·	27·5	24·4	23·6	28	26	26	24	26
Volume swept by the pistons per stroke	Cubic feet.	3·15· ×2	3·87 × 2	4·04 × 2	3·76 × 2	4·3 × 2	4·16 × 2	4·17 × 2	3·88 × 2	4·27 × 2	3·95 × 2	5·2 × 2
Diameter of driving wheels ...	Inches.	82·7	80·3	82·7	82·7	78·7	82·7	98·4	84	84	85	65
Grate area S	Square feet.	24·8	19·	26·	24·2	24·1	50·6	17·7	17·4	19·6	30·7	55·4
Heating surface S'...	Square feet.	1,076	1,310	1,813	1,662	1,555	1,342	1,034	1,262	1,340	1,930	1,714
Ratio S to S'	1 to.	43·3	68·3	69·5	68·5	63·1	26·4	58·8	72·3	68·5	62·9	30·9
Theoretical tractive force, $\frac{Pd^2l}{D}$ ...	Lbs.	11,810	16,500	18,300	13,400	18.800	15,650	14,550	16,300	17,600	19,200	28,200
Adhesive weight	Lbs.	60,000	60,600	73,600	65,800	67,200	64,000	40,300	63,000	76,500	84,000	111,500
Sq. ft. of grate per cubic ft. of volume of stroke	Sq. ft. per cub. ft.	3·93	2·47	3·22	3·22	2·80	6·10	2·22	2·24	2·29	3·88	5·32
Sq. ft. of heating surface per cubic ft. of volume of stroke	Sq. ft. per cub. ft.	170·5	169	223·5	220·5	177·	161	125·2	163	157	246	165
Ratio of theoretical tractive force to adhesive weight	.....	·19	·27	·25	·24	·28	·28	·36	·26	·23	·23	·25·
Sq. ft. of grate p. ton of adhes. weight	Sq. ft. per ton.	918	·70	·777	·82	·798	2·06	·985	1·05	·535	·81	1·105·

Note.—All these engines are 4 coupled except that in column 11, which is 6 coupled and that in column 7, which has single drivers.

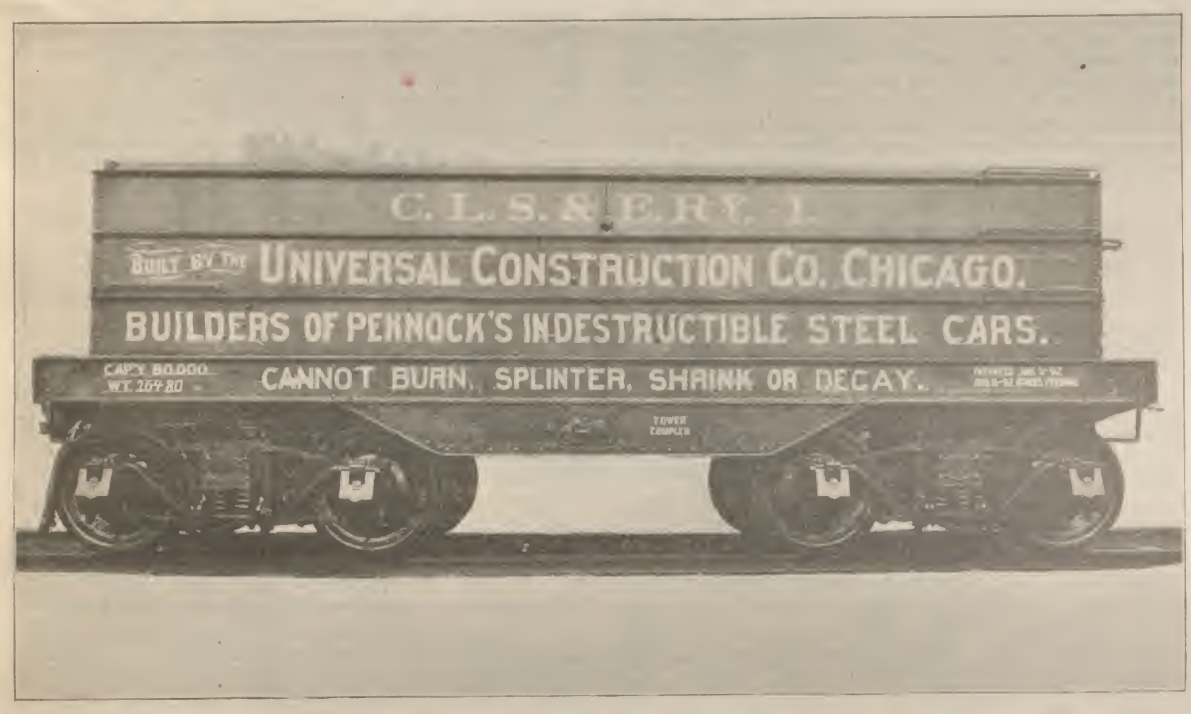
reach the smoke-box. In Europe, especially in those countries where the price of fuel is high, preference is given to a higher efficiency. In the United States power of producing steam is placed before everything, no matter how poor the economy may be.

(To be Continued.)

THE PENNOCK STEEL HOPPER ORE CAR.

The first design of the Pennock flat car was illustrated and described in the RAILWAY REVIEW of November 23, 1895, and it was again shown in the issue of May 30, of the current volume. The first design has served to show the value of thin steel in the form of channels and this shape has been employed very largely in the construction of the new hopper ore car just completed by the Universal Construction Company, of Chicago, and of which two illustrations taken from photographs are presented herewith.

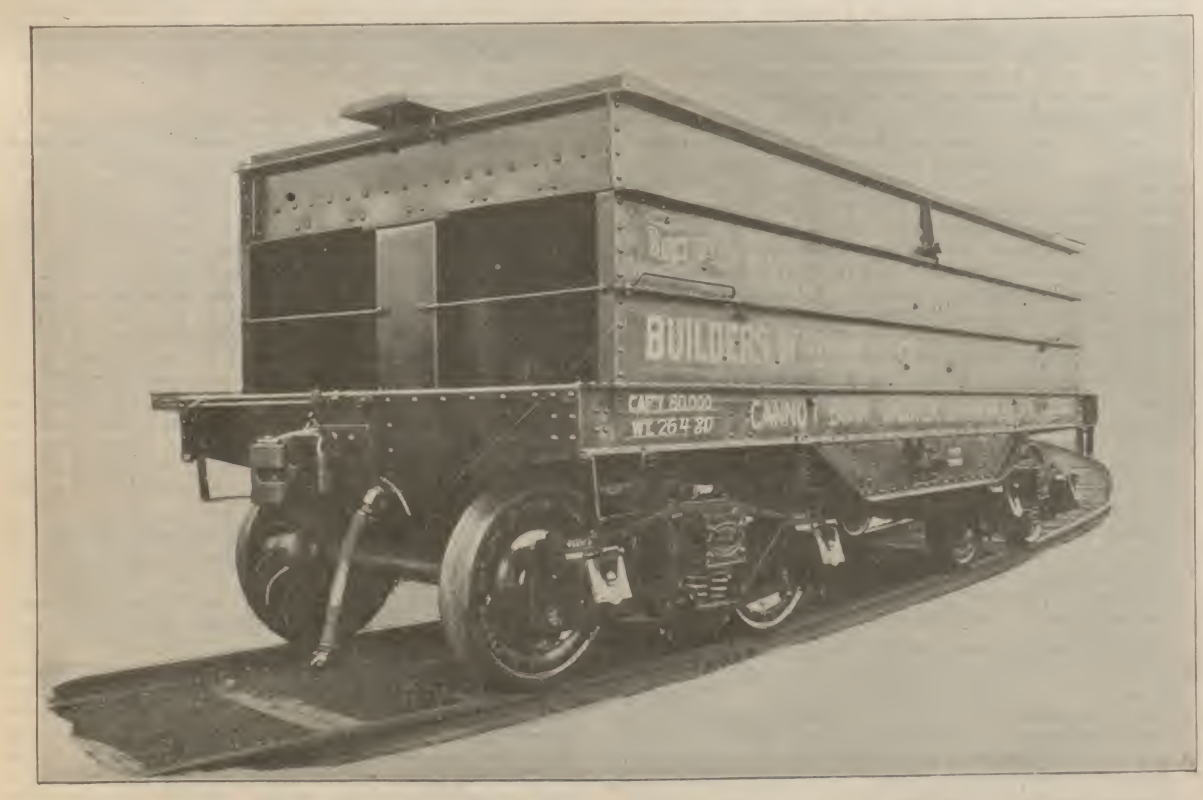
The frame of the car is simple, and consists of four longitudinal sills and steel plate end sills. The two



THE PENNOCK HOPPER ORE CAR—FIG. 1.

center sills are 15 in. 33 lb. channels with their flanges facing each other. The side sills are 10 in. 16.5 lb. channels, and under the central portions a flanged plate is carried which forms a continuation of the car siding downward to the bottom of the hopper valleys and through these extensions the door operating shaft is journaled. The end sills are composed of plates ¼ in. thick by 14½ in. deep at the center and 10 in. deep at the side sills. A deck plate 14½ x ¼ x 7 ft. 9 in. covers the projecting end of the car and is flanged down over the end sill. The deck, the method of flanging and the angle securing the end of the end plate to the outide of the side sill are clearly shown in the illustrations. The body bolsters are composed of a 10 x ½ x 8 ft. 10½ in. top bar which has 10½ in. flanges turned downward at the ends for riveting to the webs of the side sills. The corners of the top plate are reinforced by angle castings, similar to those used in the earlier design, to which the ends of the bottom member of the bolster are riveted. This member is a steel plate 10 x 1 in. in section and to it upon the inclined surfaces the side bearings are secured as before. The ends of the car are braced diagonally at each corner by a 6 in. channel which is riveted to the inside faces of the side sills and the other ends are secured to the center sills about 18 in. inside the bolsters. These channels pass directly through the bolsters and are secured to them by means of bolts which pass downward through the channel and both members of the bolster, filling thimbles being used to fill up the space between the channel and the plates of the bolster. The center casting is of H section and malleable iron with a circular boss to receive the king bolt, which is 1¾ in. in diameter. It is similar in form to that used in the flat car.

The side plates and the hopper floors are of ¼ in. steel plates with 3 in. flanges formed into channels. The form of the side and end plates and also the end posts is clearly shown in Fig. 2. The top of the sides and ends of the car is formed of a 3x3 in. angle all around. The side plates are 20 ft. long and 19⅝ in. wide, and are flanged into channels 14½ in. wide, with 3 in. flanges. The hopper plates have 4 in. flanges which are turned downward in order to give a smooth floor for the ore to rest upon. The plates are 8 ft. 7⅝ in. long. The webs of the hopper plates are turned up at the upper ends for riveting to the end plates of the car. The end plates are carried across the top of the car and flanged, so as to be riveted to the side plates. They are stiffened at the center by 19⅝x¼ in plate channels 3 ft. 2 in. long, which serve as end posts, and to which the hand holds seen in Fig. 2 are fastened. There are two hoppers, the ridge between which is formed of a plate that is turned over the 1½ in. tie rod extending across the car and projecting through the malleable washer casting seen at the center of the top side plate of the car. This washer casting is elongated so as to reach two of the flanged ribs for transverse support. The flat surfaces of the hopper floors are reinforced by ⅞ in. round iron rods, which also serve as tie rods between the sides of the car. The valleys of the hoppers are composed of 3x4 in. angles to which the hopper plates are secured upon one side, and on the other side is the bearing of the hopper door. The center sills are roofed over by means of a heavy V-shaped casting 14 in. wide.



THE PENNOCK HOPPER ORE CAR—FIG. 2.

The doors which are four in number are 3 ft. long and 27 in. wide, and are made of ¼ in. plate, stiffened with angles. They open toward the center of the car and are operated by a 1¾ in. square steel shaft, which extends across the center of the car between the hoppers and upon this shaft are mounted double armed rocking levers which operate the doors by means of connecting rods. The lock for this shaft is seen in the illustrations upon the projecting end of the square shaft. The bearings for the shaft are provided upon the hubs of the rocker-arm castings. These arms are so arranged that when the doors are closed they are in very nearly straight lines with their respective connecting rods so that the weight of the load has no tendency to rotate the shaft when the doors are closed. This dumping apparatus is simple and strong. The connecting rods are attached to the rocker arms by means of adjustable screw jaws. A connecting rod is provided for both of the lower corners of each door.

The cars are fitted with the Tower coupler, and the draft rigging is secured directly to the center sills. The end plates or sills are cut out for the passage of the coupler shanks in the same manner as would an end sill in the ordinary wooden construction. A malleable iron deadwood is provided. The pocket strap draw-bar is used with double coiled draft springs, and the draw-bar stops are in the form of a heavy steel casting, on each side, securely riveted to the web of the center sill by ten rivets which distributes the buffing and pulling stresses over twenty rivets in all. The lower flanges of the center sills are cut away to admit the followers. The trucks are of the Haskell & Barker pattern, and with this type of truck the car weighs 26,630 lbs., while the capacity is 80,000 lbs. A running board is provided the end of which may be seen projecting over the end of the car. All of the flanged plates used in this construction were formed in the machine designed by Mr. Pennock for this purpose. The cubical capacity of the car is 448 cubic feet.

This car is now on its way to Saratoga for exhibition at the Master Car Builders' Convention, and it is accompanied by one of the modified Pennock flat cars, similar in general features to the one previously described in our issue of Nov. 23, 1895, and also by the Harvey steel car which was illustrated in the issne of May 30, of the current volume. The new Pennock flat car is 34 ft. 1 in. over end sills, 8 ft. 6 in. over side sills, and 7 ft. 2½ in. wide over stake pockets. It is mounted on Haskell & Barker trucks, and weighs 25,860 lbs. complete with air brake. Of this weight 12,600 lbs. is due to the trucks, leaving but 13,260 lbs. as the weight of the car itself. The trucks were specially designed for these cars for 80,000 lbs. capacity. There are several new features about this car which improve it over the earlier design, but space permits of only the statement of this fact at this time.

THE PANCOAST VENTILATOR.

The form of ventilator designed for use on passenger cars and for other purposes where an efficient storm proof ventilator is required and which is known as the Pancoast ventilator, was illustrated and described in the RAILWAY REVIEW of January 25 of this year. The design of this ventilator is such as to give good draft when the wind blows, and to be efficient when there is no wind, as well as to be storm proof at all times. A criticism which applies to some designs is that while they give satisfactory draft with a good wind they act as chokers when there is no wind. An examination of the construction as illustrated in the issue referred to shows the basis of the claim that this form of cowl produces drafts no matter from what direction the wind is, and there seems to be equally good reason to understand why the draft in the pipe cannot become reversed.

The importance of properly ventilating passenger

cars is perhaps appreciated by railway officers, but the difficulties of securing satisfactory results are so great as to render this problem exceedingly complex. The matter would become comparatively easy of solution if artificial means of air circulation by mechanical contrivances could be instituted, and which would operate independently of the motion of the train, but this would necessitate such expensive apparatus as to preclude its employment, and the cowl or stationary ventilator is most generally used instead. It is apparent that great differences in efficiency must exist in the various arrangements of such devices, and as showing comparisons between a number of them the table given below is reproduced from a circular received from Messrs. N. and G. Taylor Co., of Philadelphia, the manufacturers' agents for the Pancoast ventilator. The table gives the results of a series of tests made by a committee of the Master Car Builders' Association, of which Mr. R. P. C. Sanderson was chairman, and which were described in the report of the association for 1894. During these tests which were made with the assistance of a Baker blower, the speed of the draft was carefully adjusted so as to be as regular as possible, and anemometer readings were taken between tests to check the wind velocity, which at no time varied more than 120 ft. per minute from the average. The speed of 49½ miles per hour was the average speed at the center of the blast 3 ft. 2 in. from the nozzle which was 12 in. diameter. The blast spread to a diameter of about 28 in. at 3 ft. 2 in. from the nozzle where the ventilators were tested. With the Pancoast ventilator there was no back draft at any angle. The tabulated results were as follows:

	Cubic ft. of air exhausted per minute with wind at 49½ mi. per hour.
Pancoast deflector, cast	90
Pancoast deflector, sheet	88½
Stasch	86
Torpedo	84
Star	83
Globe, horizontal	80
Globe, erect	71
World	72
Trailing sash	67
Dished cap	63
Roe	58
Tornado canopy	56½
Duplex	54½
Moore	49
Drop sash	43½
Creamer automatic	34½
Creamer Eureka	34
Cone cap	29
Cone and apron	12
Canopy	4

The table from which this was prepared by the committee in order to enable designers of passenger cars to obtain information from which to ascertain the number of ventilators of any of the types tested which would be required for withdrawing the proper amount of vitiated air from cars, and it is clear from the results that the number of some of the types in order to secure satisfactory results would lead to considerable expense.

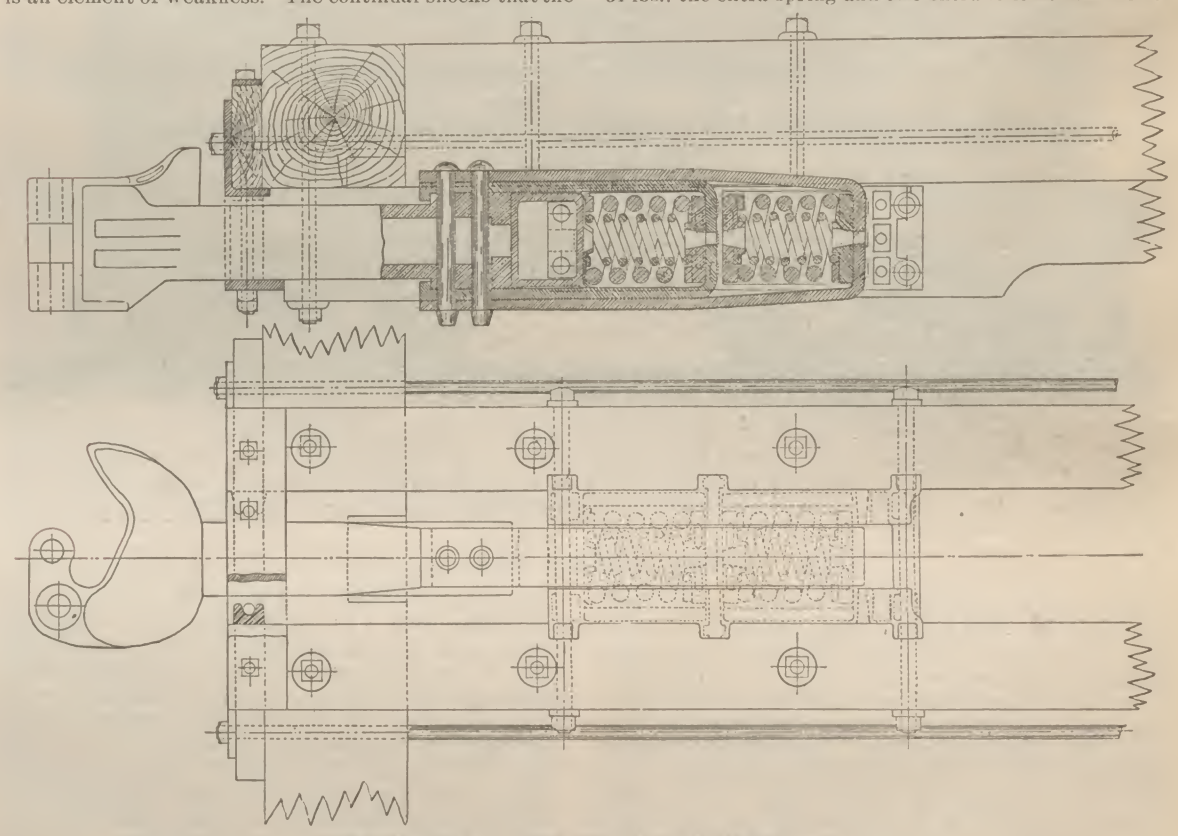
As this report is perhaps not fresh in the minds of those who may have seen it, the following quotation is worth noticing as bearing upon the necessity of proper ventilation of cars: "The movement of vast masses of people annually from one section of this broad country in search of those climatic influences modifying the course and progress of disease has become, from a sanitarian standpoint, a great unsolved problem, namely, that of accomplishing the proper ventilation of cars by the introduction of pure air, free from dust, cinders, smoke and so on, and at the same time the withdrawal of the impure air arising from the natural emanation of the body, as well as the more serious dangers accruing from chronic or contagious influences," and in another paragraph is the following: "Experiments made in Europe on animals which were inoculated with a preparation from the dust beaten out of the cushions of railroad cars in ordinary service, and which cars were not known to have carried sick people, showed that most of these animals which were inoculated died of violent diseases. Few of them lived long enough to die of tuberculosis—none of them survived. As these micro-organisms are in the air and simply settle on the dust, all this goes to show how necessary it is to carry off the foul air."

The Boston & Maine Railroad passenger department is hard at work getting ready for its enormous summer travel. Among other things it has issued a great quantity of handsome and attractive literature, beautifully illustrated. There are three separate books, each devoted to a division, so many are the summer and fishing resorts on this system. Each has many half tone views illustrating New England from the beautiful Connecticut Valley and the White Mountains through Maine to the coast line border of the United States. There is also full descriptive matter of the scenery, how to get there, and the cost both of travel and board at the hotels. There is a great amount of work in these books, and the Boston & Maine was the pioneer in their issue. The literary corner of the average general passenger agent's office is nowadays quite an important factor, and nowhere more so than on the Boston & Maine.

THREE FORMS OF DRAFT RIGGING.

The subject of draft rigging was introduced at the April meeting of the North West Railway Club by Mr. E. A. Williams, mechanical superintendent of the Soo Line, with the remark that it would probably be conceded by all that the maintenance of freight car equipment on account of weak draft gear, is one of largest items of expense in the repairs of cars. He also said in part:

I think we have all noticed that the improvement in draft gear has not kept pace with the other improvements of freight car equipment, such as brake gear, bolsters and framing. If we pass through any large freight yard and examine the draw gear of different cars, we find that a large majority of cars have the same design of draft gear that was applied fifteen years ago on 20,000 to 25,000 lbs. capacity cars. While it is true that parts of the attachment, such as pocket straps, follower plates, draw lugs and springs, are made heavier in order to resist the pulling and buffing, at the same time they are attached to the draft timbers in practically the same manner as was the practice on larger cars—that is, the draw lugs are bolted, each independently to the draft timbers, which, in itself, is an element of weakness. The continual shocks that the



BRYANS CAR COUPLER ATTACHMENT.—FIG. 1.

drawbar receives weaken and loosen the bolts, and eventually draft timbers are split and destroyed. There are a great many excellent devices, in a number of cases patented, which are an improvement for draft gear. Among others I might mention one where the spring is enclosed in a casing with double projections one each side of the spring pocket, gained into the draft timbers. the bolts extending through both draft timbers and spring casing, and bolting the draft timbers and spring casing or box firmly together. I think this is a decided improvement, and an arrangement that will reduce the damage to the draw gear. There are others that I have noticed, such as double springs, and in one case that I have in mind where not only double springs but a double pocket strap is used. This, in my opinion, is a very excellent device, and one that certainly will reduce the cost of repair of draft rigging. Of course the continuous drawbar is no doubt an improvement over the old style of drawbar rigging, but, from my observation, there is an element of weakness in the continuous bar, i. e., it is liable to stretch, and I think that there has been considerable difficulty experienced in keeping the rods at the proper length. On a large number of cars that have recently been built I noticed that the drawbars have been applied directly to the center sills, doing away with draft timbers. Of course an arrangement of that kind would be impracticable on cars already built for draft timbers, for the reason that it would raise the drawbars too high above top of rail. At the same time, it strikes me that where cars are designed to place the drawbars or couplers between center sills, it is a very excellent arrangement.

Mr. H. S. Bryan made the following remarks: We are using and have adopted a standard draft rigging composed of two sets of springs, set tandem within the side castings which are secured to the draft timbers and bolted together with through bolts, making it impossible for the draft timbers to spread, and also protecting them from abrasion by chafing of the follower plates. We have probably 2,000 cars equipped in that manner, which are giving very satisfactory service. (The design is shown in Fig. 1). We have never yet broken any springs or parts of the attachment, either in wrecks or in actual service. From my experience with the device, I could recommend it for cars in heavy freight service. By the use of two sets of springs we get double the resistance that is obtained in a single spring draft rigging. Our standard is a 6x7 in. double coil spring. Of course, any sized spring could be used according to the capacity required. With two 6x7 in. double coil springs we get a resistance of from 34,000 to 36,000 lbs. both in buffing and pulling. The device is composed of malleable iron side castings, provided with suitable stops for the spring followers. On the rear end of the drawbar are riveted two yokes—the inner yoke providing a pocket for the forward spring and the outer or longer yoke taking the rear spring. The inner yoke compresses the forward spring, and the outer yoke the rear spring in pulling. In buffing, a square, sliding, box-shaped spring follower at the end of the drawbar compresses the forward spring, and the rear end of the inner yoke the rear spring; so the pressure both in buffing or pulling is applied to both springs simultaneously.

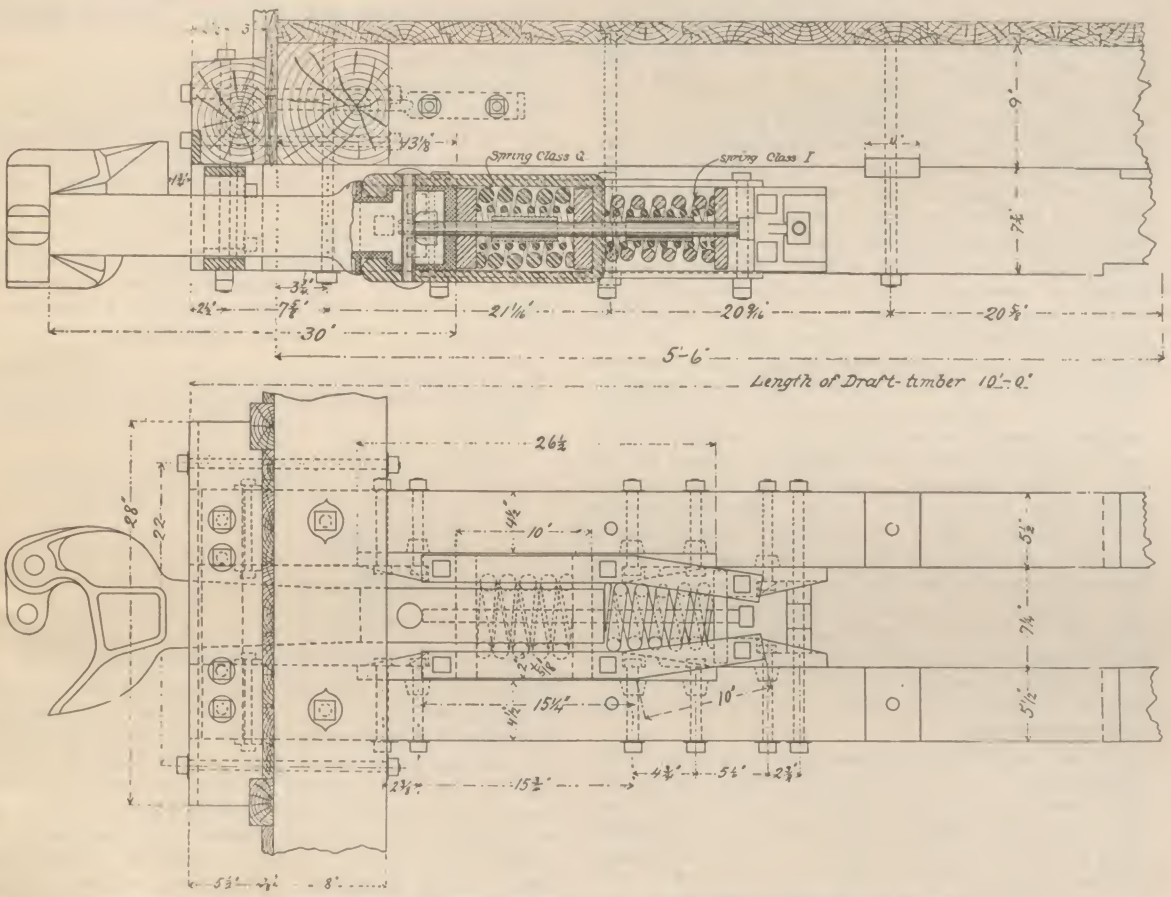
The side castings we are using are about 25 in long, provided with three lugs or ribs, which are gained into the draft timbers, 1 in. deep, and are 2 in. in width. On account of the large bearing of the side castings on the draft timbers, we have found that it is not necessary to use the best quality of oak for draft timbers. We have several hundred cars equipped with pine draft timbers, and in our very severe service, on heavy grades and switching, we have found they meet all requirements. That is quite an item in the reduction of the cost of draft timbers.

The additional cost per car for this year would be for the extra yoke, which, when made of 4x¾ in. iron weighs about 54 lbs., the extra spring and two extra followers. The followers and side castings are made of the best malleable iron, and are very light. All castings, including follower plates, weighing only 230 lbs. per car. The cost of the extra springs, at present prices, is about 75 cents each, and the extra followers, which weigh 2¾ lbs. each. Probably $2 to $2.50 extra would cover the cost per car over the old style draft rigging.

In regard to shearing of rivets; before we put this device in service I made some pretty severe tests of shearing the rivets. I put a pressure against the back end of the forward or inner yoke of 100 tons, before showing any signs of shearing the rivets, and at 120 tons they were sheared a full thirty-second of an inch, and the yoke spread about three-sixteenths of an inch. Of course the back end of the outer yoke does not take any strain except in pulling. From actual use during a year's service we have never found any of the rivets sheared, or any of the parts broken. We have had draw-bars twisted out of the castings completely and broken off; in fact we had a wreck of 14 cars, 7 of which were equipped with this attachment, and there were not parts of the attachments broken so they could not be put back in the cars when we rebuilt them. This shows the benefit of a large bearing on the draft timbers, and the thorough manner in which they are tied together by through bolts makes it a very strong device.

Mr. Wm. McIntosh, master mechanic, Chicago & Northwestern Railway, contributed the following:

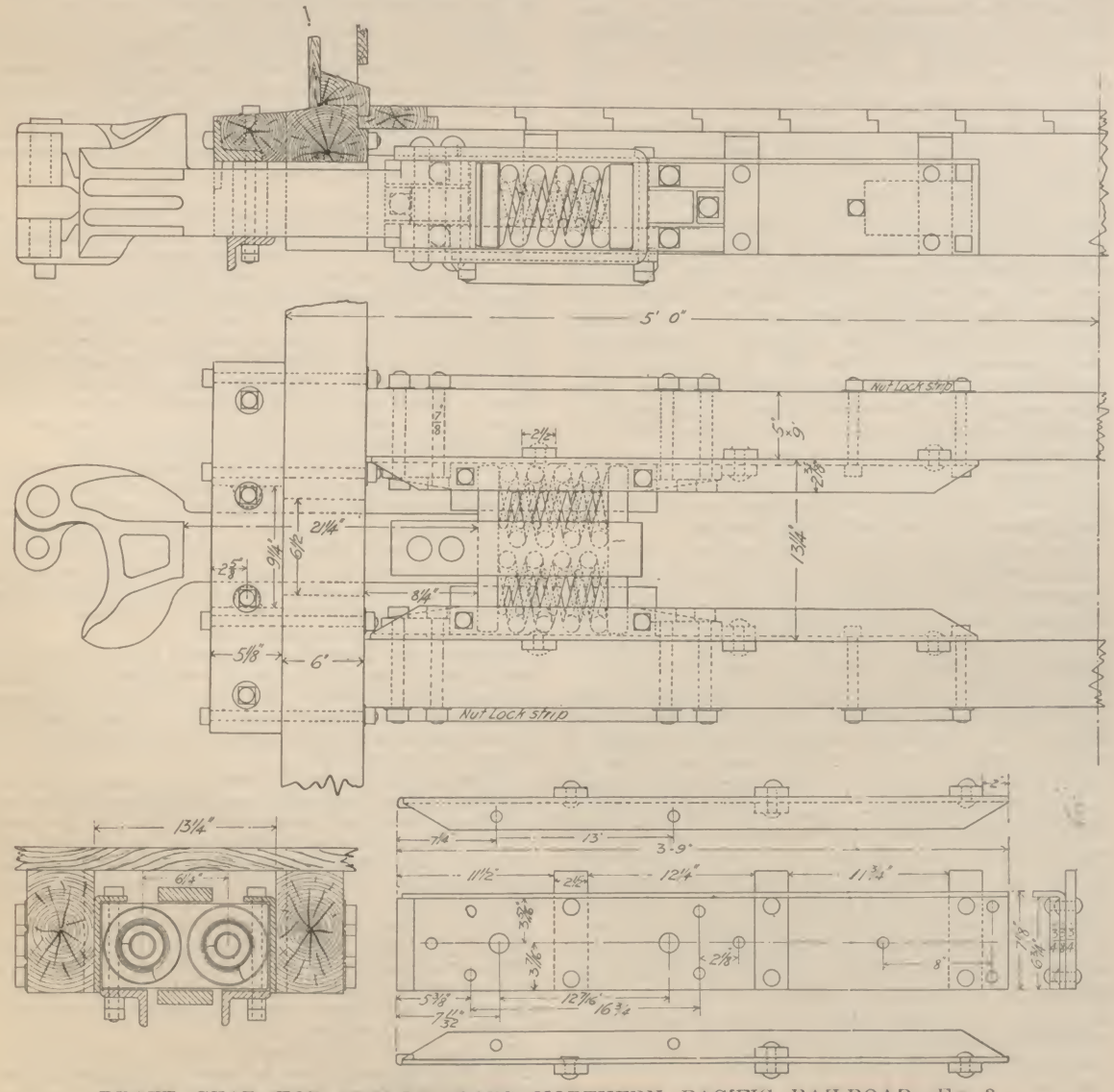
The Northwestern road is using a draft rigging of the double spring type (shown in Fig. 2), but the check castings are quite differently arranged from Mr. Bryan's; the draft timbers are quite deeply dapped on either side to receive the front ones, while the last bolt of the back pair passes through both timbers and the thimble between clamping them tightly together, this thimble also forming a stop for the pin that holds the draw-bar springs in place. The check straps are long enough to engage all of the check plates, thus making them substantially as strong as the combination pocket shown by Mr. Bryan. We have a great many cars fitted up in this way, some of them having been in



DRAFT GEAR FOR BOX CARS—CHICAGO & NORTHWESTERN RAILWAY—FIG. 2.

service for a number of years with very satisfactory results, in fact, it is almost impossible to destroy the draft rigging without wrecking the car.

The form of draft gear which has been applied by Mr. John Hickey, superintendent of motive power, machinery and rolling stock of the Northern Pacific Railroad to the 70,000 cars recently built for that road is illustrated in Fig. 3, which was taken from a drawing received through the courtesy of Mr. Hickey. This arrangement brings the drawbar between the two center sills and through the end sills of the car and gives large bearing surfaces to support the drawbar stops. The follower plates are long and provide seats for double coiled springs as shown in the plan view. The ordinary pocket strap is used, made of 1x4 in. iron. The thrust from the follower plates is received upon pressed steel protection plates which are 3 ft. 9 in. in length and weigh 59 lbs. each. These are shown in detail in the lower right hand corner of the drawing, where it will be seen that each plate is provided with a flange 2⅜ in. in width upon the top and also three ⅝x2½ in. cleats are riveted to the outer side of the webs of the plates and in the plan view, it will be seen that these cleats are let into the sills to assist in holding the plates in position against pulling and buffing stresses. In addition to the cleats, there are nine ⅞ in. bolts passed through the sills for the same purpose. These bolts are provided with nut lock strips as shown. In this type of rigging the deadwoods are reinforced by a cast buffing plate and the carry iron is composed of a 3½x4 in. angle secured to the deadwoods with four bolts. The drawbar guides are also in the form of angles. Guard thimbles, not clearly shown in the drawing, are employed to take the wear due to the lateral motion of the drawbar where it passes through the deadwood. This form of draft rigging is of special interest in connection with the illustrations of the two which precede it.



DRAFT GEAR FOR 70,000 LB. CARS—NORTHERN PACIFIC RAILROAD.—FIG. 3.

The Boycott Abomination.

When the truth needs to be spoken it is by no means rare that the class journal and not the secular press that gives it utterance—as witness the following by W. H. Ellis in the Northwestern Lumberman on the Milwaukee street car strike:

I was in Milwaukee last week, and took the first train I could get out of town. Milwaukee, as a community, presents to-day one of the saddest spectacles a good-sized town ever made. Paris had her reign of terror, but it never was as bad as the present condition of Milwaukee. It is fast reaching a point where yellow dogs no longer dare to grub for food in the alley back of a meat market until they first find out whether the father of the man who sells oats to the stable where the man that delivers stock to the butcher keeps his horses rides in the street cars or not. If you ride on the cars in Milwaukee you thereby accumulate a commercial pest which bars you from everywhere. Several years ago a few gentlemen of no particular literary ability or artistic taste, but wise of judgment and steadfast of purpose, produced a certain concise statement of eternal truth based on the fundamental doctrine that all men are created free and equal. It required a lengthy and somewhat heated discussion to establish the principle, but it became so firmly fixed in the hearts of the people that they backed it up with what has for years been fully recognized in the courts of this and other countries as the constitution of the United States. The venerable document has been through some tight places, but never has its spirit and the principles of the declaration of independence been so ruthlessly and so flagrantly violated as they now are in Milwaukee. The ravage and the violence of war is nothing in comparison with the slavish subjugation of the whole people to a mob that is cunning enough to refrain from overt acts and vile enough to stifle liberty. I will yield to no man in my warm sympathy for labor. I am myself a laboring man. I work for what I can earn. Labor has its wrongs which must be righted. But when labor takes into its hands the fearful enginery of the boycott and grasps its hands upon the throat of personal liberty it ceases to be labor and becomes a public enemy against whom every citizen who loves his country and his home and himself must rise as he would rise against destruction, or if he chose not so to do his duty he must smile and bare his neck to the yoke that is being put upon him. There is nothing whets the appetite of the tyrant like tyranny, and if this organized horde of tyrants can successfully terrorize a city like Milwaukee the time is short in which the stars and stripes will be a symbol of peace and liberty, unless all men who value liberty rise in their might and stamp it out. No help need be expected from the government. There is no party in any state which is not fearful of their votes. There is no public officer save only Cleveland, who dares to meet the issue. It must be met by the sovereign will of the people in the majesty of their own might, and it must be met without temporizing.

As an instance of the extent to which the reign of terror has proceeded, a case occurred the other day which would be silly if it were not awful. A traveling man representing a New York house was in the largest retail store in Milwaukee. He had sold them goods for years, and the buyer had just about finished giving him a good order when a man came in and called him to one side. After a little talk the buyer came back and said he couldn't buy the goods of him because he was stopping at the Pfister hotel, and Mr. Pfister was a director of the street car company, and if he bought from him they would be boycotted. He said if the salesman would leave the Pfister and go to some other hotel he would give him the order. But the salesman wasn't built that way. He not only declined to do that, but he very emphatically added that a business that was subject to destruction any time, on the whim of a mob, wasn't a safe one to deal with, and that the credit of that firm with his house was cancelled right then and there. He went out and wired his house for instruction and they wired him under no circumstances to sell any goods in Milwaukee and to cancel any orders he had taken. That's the business way to deal with a boycott. Nor do the ruffians confine their operations to men—they assult with this weapon which seems for the time to be mightier than the egg passe, women and children.

Not long ago a woman stepped from a car in a remote part of the city. Two men—cowards always go in pairs—stepped up to her and asked her if she was not a school teacher; she said she was. They told her if she expected to hold her position she must ride in the 'busses operated by the strikers or walk. She said as the 'busses gave no transfers, she could not afford it, as it would cost her 15 cents, whereas the cars only cost her five. Then they said the difference would be supplied from the strikers' fund. In any case she must cease riding in the cars, or lose her position. Being a woman, and not therefore necessarily either a fool or a coward, she said she would do exactly as she pleased, and she still rides in the cars and still teaches the young idea how to shoot. Liberty is the highest priced luxury of humanity—and as Gelett Burgess says, it is the luxuries that are necessary—and what makes it sad is to see a whole community dumbly hand over to a mob that for which more blood has been shed an

more lives lost, than for any one thing on earth. Men have a right to strike—that is not to be questioned. But that does not carry with it the right to pull tail feathers out of the eagle, nor punch holes in the flag we have done so much to own. In this connection the fact should not be overlooked, that very many law abiding citizens of Milwaukee are loyally and courageously standing to their guns, and that organizations of merchants have declared unequivocally that they will no longer submit to tyranny —but the fact remains that the mass of the citizens are as scared as a 16 year old girl who has just seen a new kind of a ghost.

THE CARNEGIE STEEL CARS.

The application of steel to car construction has for a number of years occupied the attention of progressive car builders on account of the obvious advantages to be derived from employing this material and it now seems to be decided among railway officers having to do with rolling stock, that the time has arrived for the practical use of this material. The experimental work which has been done in this country and the high degree of successful development of metallic car construction abroad, justifiy the conclusions that these officers are correct in their judgment. In the RAILWAY REVIEW of May 30 of the current volume, two forms of steel cars were illustrated and in the supplement which appears with this issue will be found illustrations from drawings and photographs of other types of cars built of steel by the Carnegie Steel Company, Ltd., of Pittsburgh, Pa., at its Keystone Bridge Works department at Pittsburgh. These illustrations show the method of construction of four cars which have already been sent by this company for exhibition at the Master Car Builders' convention which is to be held next week at Saratoga, New York. Two of these cars have double hoppers and the other two are flat cars.

By referring to the supplement the method of construction of the hopper cars may be seen in detail, and an explanation of this design with the aid of the drawings will serve to show the general method employed in those of the flat type. The general dimensions of the hopper cars are as follows: length over end sills 30 ft.; distance between truck centers, 19 ft. 10 in.: wheel base of trucks, 5 ft. 2 in.; width over end sills, 9 ft. 5½ in.; width over door shafts 9 ft. 10½ in. The length of the car body inside of the end plates is 28 ft. The depth of the sides over the sills is 5 ft. ½ in. The hight from top of rail to top of sides is 8 ft. 9 in. The weight of these cars is 39,950 lbs., the capacity being 100,000 lbs. There are two cars of this pattern which are numbered 1,008 and 1,009, the former of which is shown in the engraving which is taken from a photograph and the details of which are presented from the working drawings. It will be seen that this car has two hoppers and that the construction is entirely of steel. These cars are mounted upon Fox pressed steel trucks and are equipped with the Westinghouse friction buffer, the Janney coupler, the Westinghouse air brake with hand attachment at both ends of the car, Carnegie nickel steel axles and the Potter hopper door opening mechanism and fastening which is clearly shown in the illustrations. In the general the construction conforms to the specifications of the Master Car Builders' Association. These cars have been tested with a load of wet sand and pig iron weighing 125,000 lbs. under which they gave satisfactory results. It is stated by the builders that the weight can be reduced to not over 35,000 lbs. maintaining with a large factor for safety a capacity of 100,000 lbs. In actual service these cars have been utilized for transporting ore from the lakes to Pittsburgh and it is reported that in such service they have given entire satisfaction.

In the drawings of the hopper cars attention is called to the method of construction which employs side sills of 15 in. I beams weighing 41 lbs. per foot, and center sills of I beams of the same size. The end sills are of 15 in. channels, having plates 12x¼ in. riveted to their upper flanges. The end sills are secured to the webs of the side sills by means of two 5x3 in. angles. The body bolsters are composed of two 12 in. 20 lb. channels with 14x$\frac{5}{16}$ in. plates secured to their upper flanges. A center transom is provided employing a 12 in. 32 lb. I beam. The draft gear is supported upon a carry frame between the center sills. The side plates of the car are about 4 ft. long and 59⅞ in. in width, and are stiffened by 5x3 in. angles. The floor plates are ¼ in. in thickness. The hoppers are secured to the side and center sills by 3x3 in. angles. The corner posts are composed of angles of the same size, and this section is employed for the chief portions of the framing and the bracing. The method of stiffening the corners of the cars by means of the diagonal braces to the bolsters and gussets in the corners, may be seen in the plan views of the frame. The gussets are composed of $\frac{5}{16}$ in. plates which are riveted to 3x3 in. angles. The ridge plate running transversely of the car between the two hoppers is 10¼ in wide by ⅝ in. thick, and is bent to form the edge. It comes within 2 ft. 10⅛ in. from the top of the car sides. Those portions of the hoppers which are roofed over the center sills and extend lengthwise of the car, are composed of plates 15½ in. wide by $\frac{5}{16}$ in. thick, secured to ridges of 4x4 in. angles. The vertical bracing of the ends of the hoppers is shown in the longitudinal section, together with the method of making the joint between the ends of the hoppers and the end plates of the cars, this joint being strengthened by a ⅝ in. gusset plate. The door plates are ¼ in. in thickness, mounted upon frames of 3x2½ in. angles, and the hight of the door openings is 2 ft. 3 in. The door shafts are 2⅝ in. in diameter, passing through the car from side to side, and the locking attachment for each shaft is placed on one side of the car only. It will be seen that the doors open toward each other. The center plates are of pressed steel. The distance from center to center of the trucks is 19 ft. 10 in., and the wheel base of the trucks is 5 ft. 2 in., the wheels being 33 in. in diameter. The axle journals are 4⅝x9 in. On one side of each car steps are provided which are made of 2x½ in. iron, and project into the car about 7 in. It is not necessary to point out more of the details of construction, as these are clearly indicated upon the drawing.

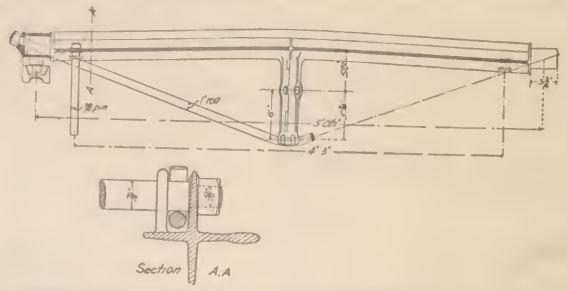
The flat cars illustrated have been in service for the Carnegie Steel Co., in conveying finished steel products, for which they have been utilized for some time. These cars are numbered 1,002 and 1,007, the former being somewhat heavier than the latter. The frames of these cars are of steel and they are decked with 1½ in. tongued and grooved flooring. They are equipped with Janney couplers, the Westinghouse air brake with hand brake attachment at one end of the car only, and in all respects they fulfill the requirements of the Master Car Builders' Association. The general dimensions are as follows: Length over end sills 34 ft. 1 in.; length between truck centers, 24 ft.: wheel base of trucks, 5 ft. 2 in.: width over decking, 8 ft. 7½ in.; width over stake pockets, 9 ft. 5 in., and hight of deck from top of rails 3 ft. 11½ in. The capacity of each of these cars is 80,000 lbs.: the weight of car numbered 1,002, which is shown loaded with steel rails, is 26,220 lbs. The weight of car numbered 1,007 is 25,150 lbs.

It should be stated that one of each type of these cars were shipped from the works in Pittsburgh to Saratoga loaded to their full capacity. The axles are stated above to be of nickel steel, and we are informed that the metal contains 3 per cent of nickel, which is the proportion employed in the manufacture of armor plate. The peculiarity of the fracture of nickel steel in this form has been noticed in drop tests of axles similar to the ones used on these cars. Instead of developing a crack as an ordinary steel axle will usually do, and then breaking off short through that crack at the next blow, it has been found that a nickel steel axle will not break until it has received from 25 to 30 blows, after the first appearance of the cracking. After testing one of these axles to destruction in this way, it was found that the crack had spread spirally about the axle, and this accounts for the unusual amount of punishment which it received after an ordinary steel axle would have been entirely broken. This is not the first use which has been made of nickel steel in axles. It has been employed in the construction of cars for use in handling rough and finished material about the various works of the Carnegie Company for some time, this concern having found it impossible to handle the product from their works upon the old light capacity cars of the ordinary construction.

The builders state that while the cost of a steel car will naturally be in excess of a wooden one, sufficient experience has already been acquired to warrant the statement that on a commercial scale steel cars can be constructed at a cost not to exceed the cost of wooden ones per ton of carrying capacity, and with a factor of safety in favor of the steel construction. The following are some of the advantages claimed for steel cars: lightness, durability and strength; a large percentage of live to dead load; long life; reduced cost of maintenance; little liability to damage and great salvage value. It is stated to be the object of the Carnegie people in the construction of these cars to show what may be done by the employment of steel in car construction in the way of the possibilities of this material, rather than with the intention of entering the field of the car building business. It is also fair to assume that such a producer of steel as this company is, would welcome the introduction of steel car construction upon a large scale. It seems to be only a question of time when the owners of cars will come to appreciate the longer life of metallic cars as affecting the earning capacity of the money invested.

THE WILLIAMS MALLEABLE BRAKE BEAM.

The new design of brake beam patented by Mr. A. P. Williams superintendent of the Madison Car Works of Madison, Ill., is shown in the accompanying illustration. There are very few parts used in this construction and the arrangement of the material was prepared with a view of strength, neatness and simplicity. The beam itself consists of a single casting of malleable iron in which are also incorporated the fulcrum, the loops for the guide pins and for the safety chains so that no attachments are required for these parts and a number of parts are thus consolidated into the one casting



THE WILLIAMS MALLEABLE BRAKE BEAM.

which therefore permits also of doing away with the bolts ordinarily used for attaching such parts. The special claims made for this beam are durability and strength and one of the special features upon which these are based is that the form of the beam is such as to provide strength and to admit of no lodgment for water or cinders which causes corrosion. The beam has been tested to 36,000 lbs. stress before breaking. The form of the tension member and its attachment to the ends of the beam are clearly shown and the form of the beam itself may be seen in the sectional view together with the method of attaching the safety chains. The weight of the beam is 75 lbs.

An Appropriate Action.

At the Car Accountants Convention which has been in session in Cleveland, Ohio during the current week the following preamble and resolutions were unamiously adopted.

Whereas, The International Car Accountants' Association has learned with profound sorrow and most sincere regret, of the death of Mr. W. G. Wattson, late superintendent of the Hudson division, West Shore Railroad, and formerly an active and honorable member of this association, which took place in New York City, March 10, 1896, as the result of injuries inflicted by his fellow man, and

Whereas, The death of Mr. Wattson at the hands of an assassin, a discharged employe, adds another event to the criminal history of this country, now, unhappily, of alarming frequency, and once again most earnestly emphasizes the need of a rigid but just enforcement of law, as a check upon the murderous or other unlawful inclinations of the dissatisfied employe who seeks to redress real or imagined wrongs with personal violence or other means of an unlawful nature; and

Whereas, This association sincerely believes that the laws' delays and the injudicious use of the pardoning power and other acts of executive clemency, whereby the ends of justice are not only long deferred but often defeated, not only inspires the hope of escaping the extreme penalty of the law, but to a certain extent in itself is a serious menace to the welfare of society, as tending to shelter the vicious from retributive justice, and encouraging them to take more desperate chances than they would dare to take if the adequate punishment was sure to be meted out in vindication of the majesty of the law and for the necessary protection of life and property, and

Whereas, While, as law abiding citizens, we may not be justified in criticising the ways of justice and do not wish to promote disrespect for executive or judicial methods, we nevertheless feel the loss of our highly respected and sincerely esteemed friend, whose untimely death while in the faithful discharge of duty, could have been prevented by the well grounded belief that inexorable consequences are sure to follow swiftly upon the commission of such heinous crimes against society, and

Whereas, Mr. Wattson was regarded by his friends and associates in all parts of the country as an able and efficient railroad officer, a kind and considerate friend, a companionable man with whom it was a pleasure to associate, and whose ability and fearless integrity commanded honor and respect; therefore be it

Resolved, That his death is widely and most profoundly deplored and the deep, heartfelt and earnest sympathy and condolence of each and every person who had the honor and pleasure of his acquaintance, near and distant, will be freely extended to his devoted wife and loving daughters, upon whom the burden of this great sorrow falls with intense severity.

Resolved, That as a mark of our great respect, and in perpetuity of Mr. Wattson's memory, the sentiments herein expressed be declared as part of the official proceedings of this convention for permanent record, and that all railroad and other papers be respectfully requested to publish them; and be it further

Resolved, that Mr. Walter W. Wheatley, car accountant of the West Shore Railroad, is hereby delegated to present to Mrs. Wattson in person a copy of the printed pro

SUPPLEMENT

TO

The Railway Review

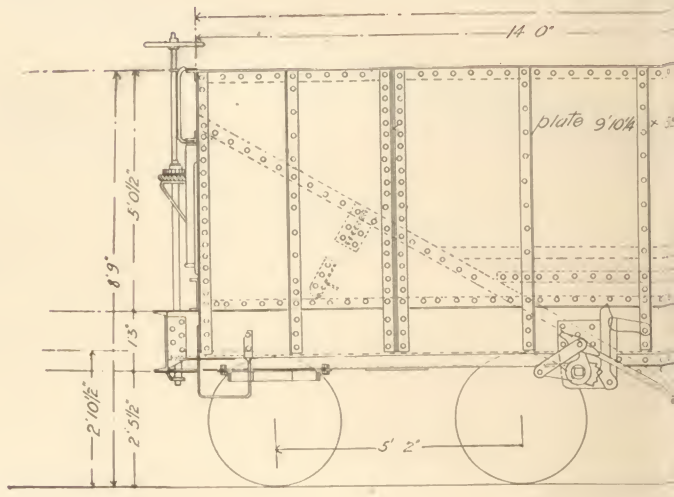
June 13, 1896.

General view and details of construction of Steel Hopper and Flat cars designed by the Carnegie Steel Company, Ltd., and constructed at their Keystone Bridge Works Department, Pittsburgh, Pa.

STEEL FLAT CAR, CAPACITY 80,000 LBS., WEIGHT 25,150 LBS.

STEEL FLAT CAR. CAPACITY 80,000 LBS., WEIGHT 26,220 LBS.

STEEL HOPPER CAR, CAPACITY 100,000 LBS., WEIGHT 39,950 LBS.



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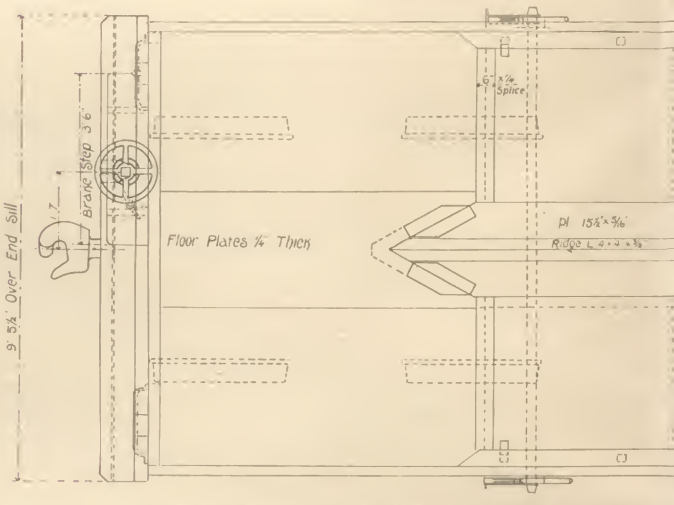
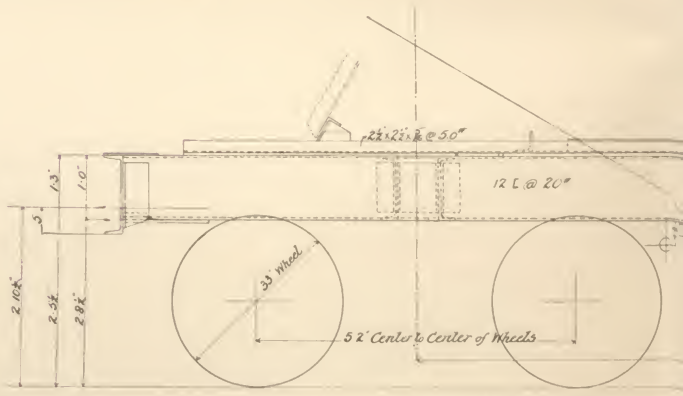
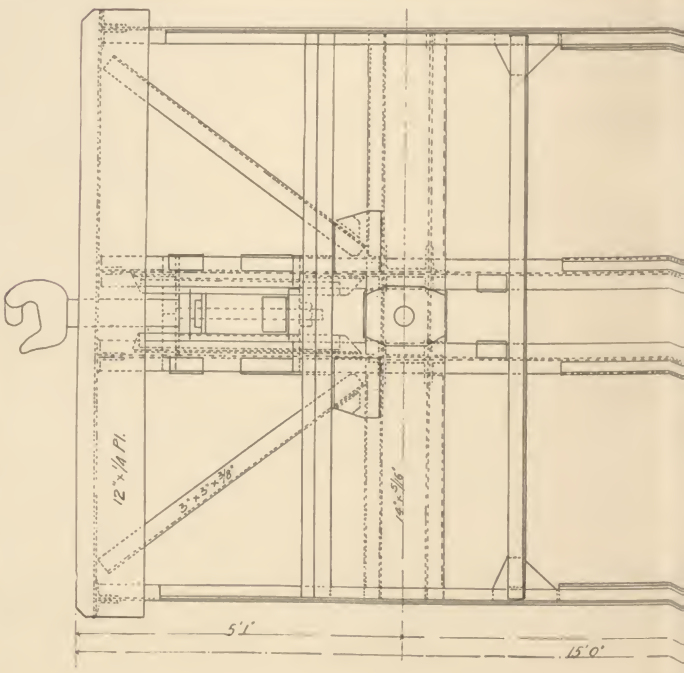


HALF PLAN SHOWING FLOORING AND H



Half Side Elevation

HALF SIDE AN



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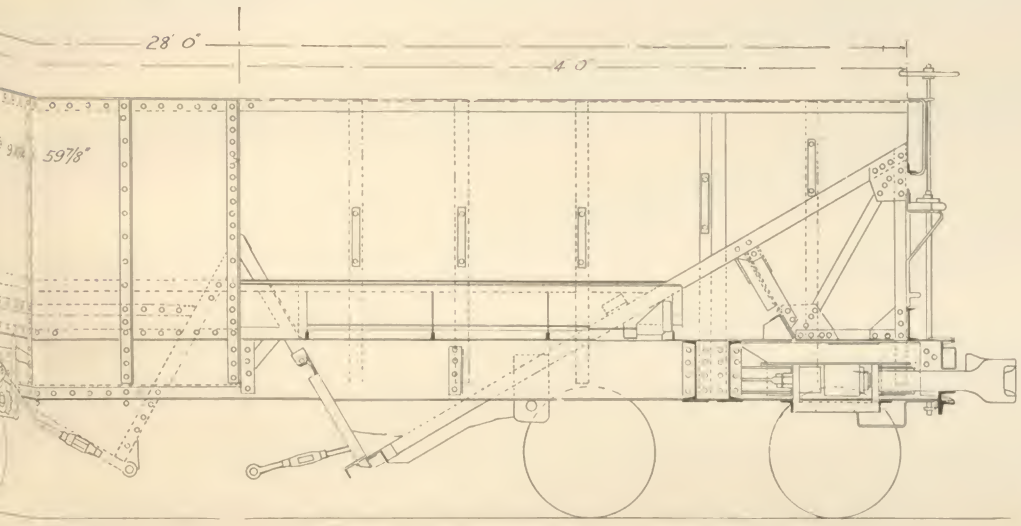
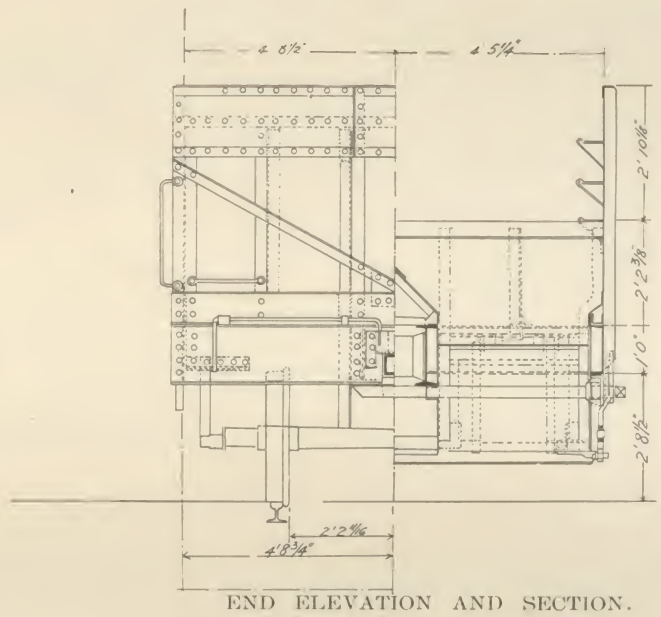
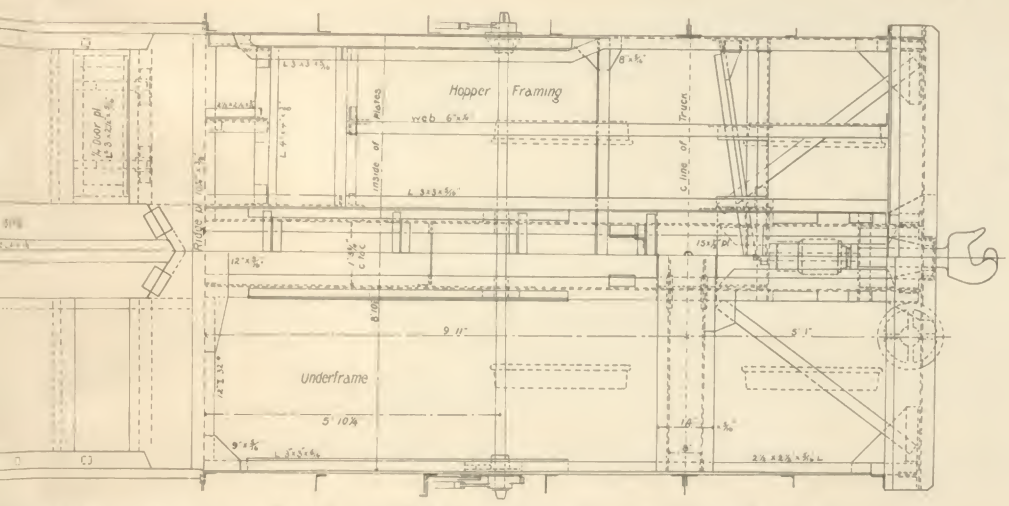


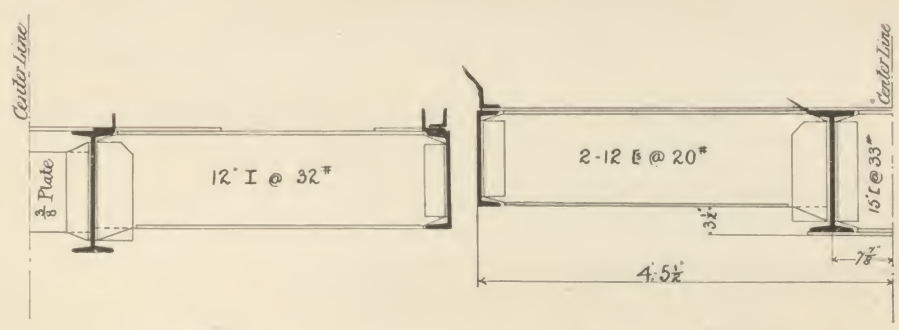
SIDE AND SECTIONAL ELEVATIONOF HOPPER CAR.



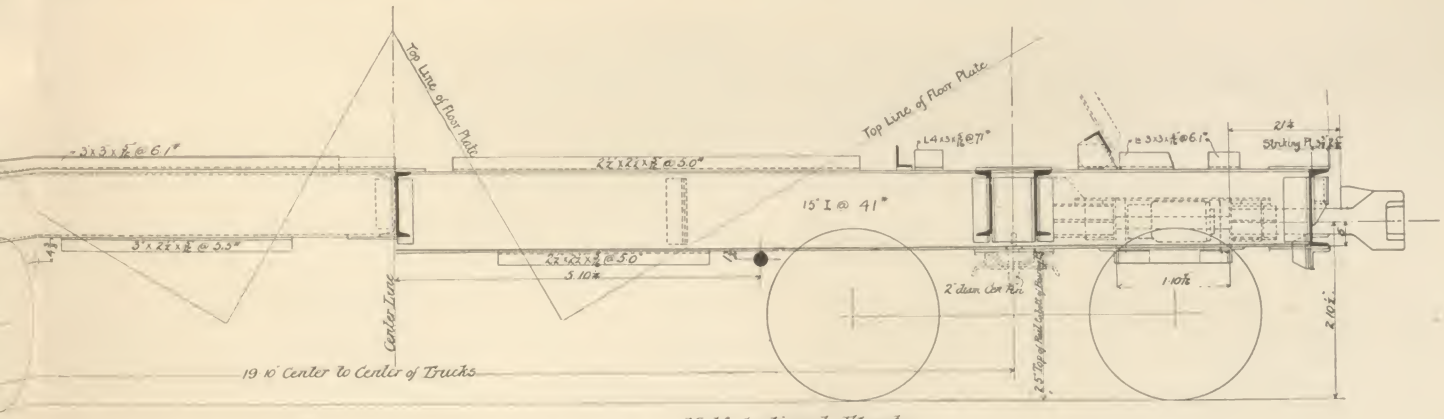
END ELEVATION AND SECTION.



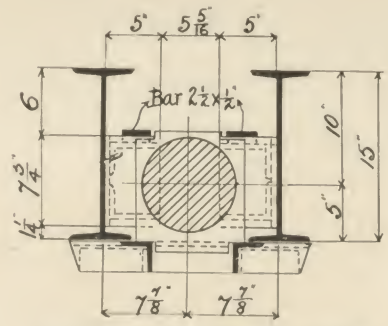
AND HALF SECTIONAL PLAN SHOWING FRAMING OF HOPPER CAR.



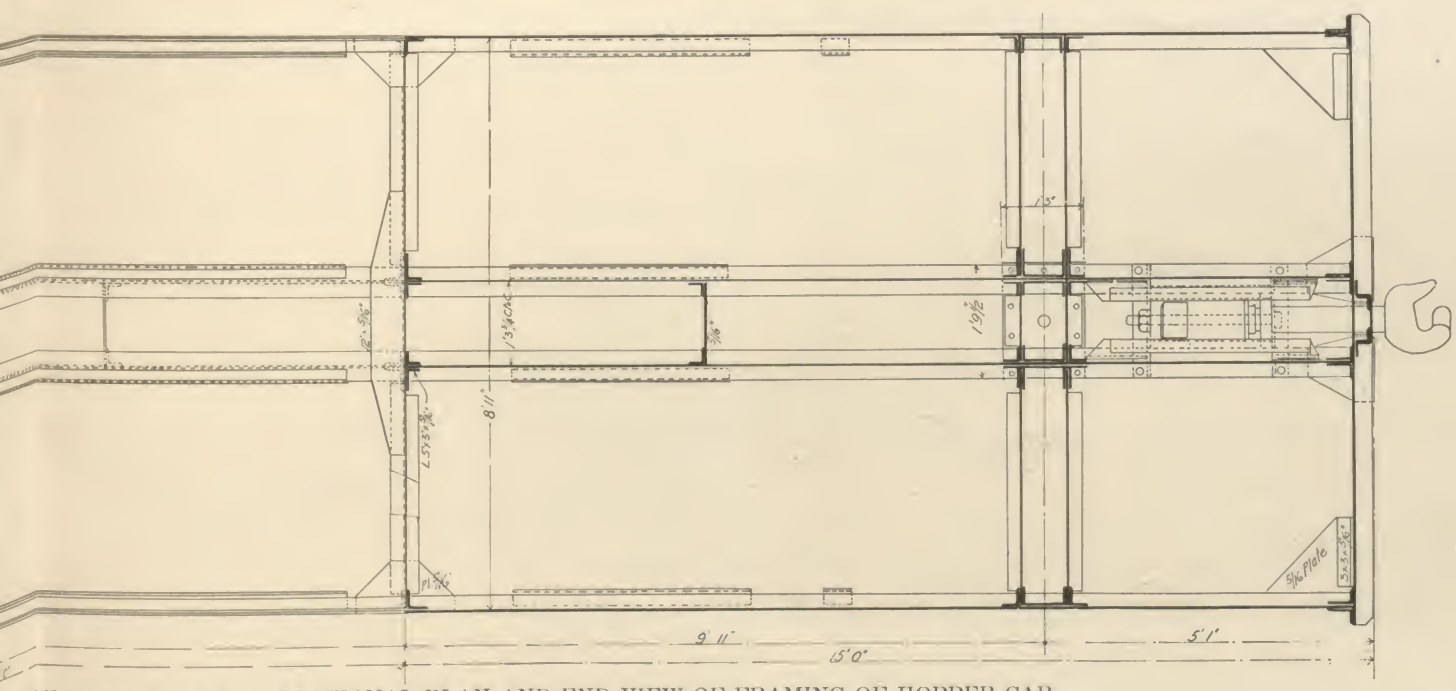
CENTER TRANSOM. BODY BOLSTER.



SIDE AND HALF SECTIONAL ELEVATION OF CAR FRAME OF HOPPER CAR.



SECTION OF DRAFT GEAR.



HALF PLAN AND HALF SECTIONAL PLAN AND END VIEW OF FRAMING OF HOPPER CAR.

ceedings of this, the twenty-first annual convention of this association, dedicated to the honor of William Grafton Wattson, with our respectful and friendly consideration for herself and family, and that we commend them to the care of the Great Creator in this hour of sorrow and affliction, who alone has the power to lighten the burden of such great calamities and soothe the sorrows of those who mourn.

The Chemistry of Lubricants.

The function of a lubricant being to keep the surfaces on which it is smeared from coming into contact with each other, and at the same time to allow of their motion relative to each other to take place with as little impediment as possible, it is obvious that a special class of bodies must be used for these purposes, having particles which slide easily over each other, while having sufficient cohesion to prevent the ready rupture of a film composed of them.

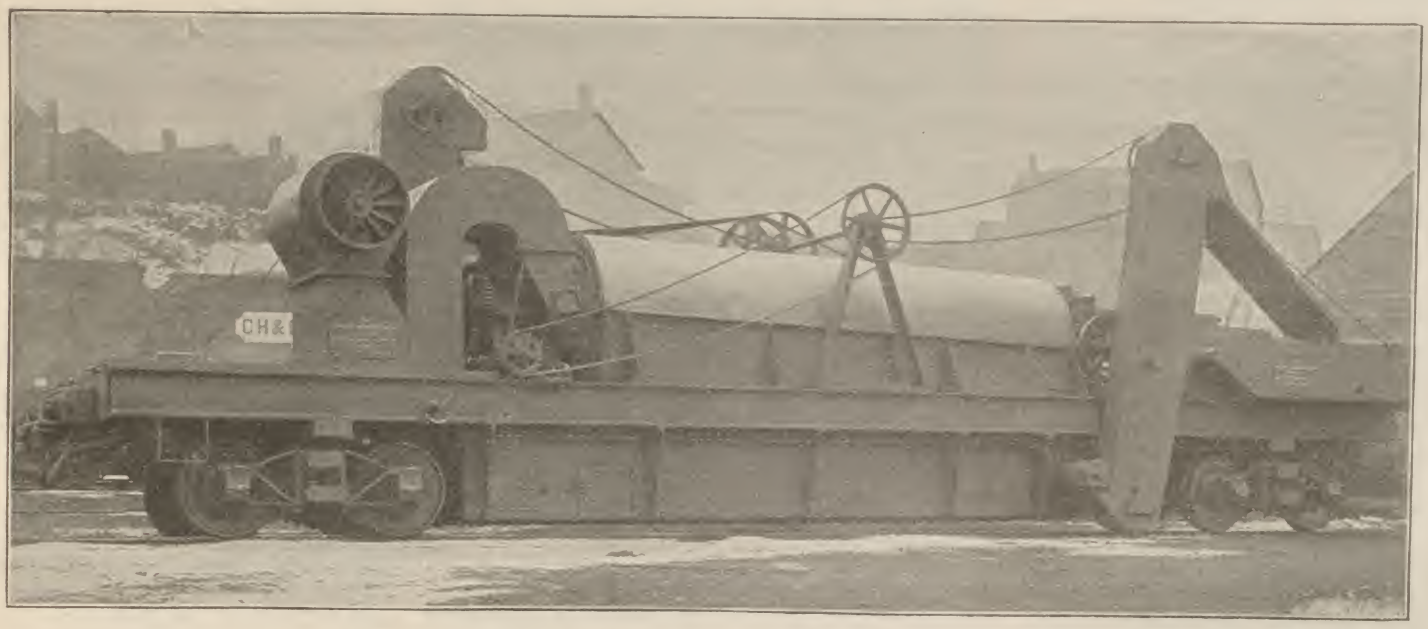
A further result of this conception of the functions of a lubricant is the realization of the fact that the speed with which the surfaces move over each other, and the pressure tending to force them together, must be considered in choosing any individual from the class fitted for a given kind of work. The logical outcome of this is that every different kind of bearing needs a different lubricant to enable it to run with the least friction. In practice it suffices to use a different kind of lubricant for each different class of bearing, even when the members of the class are not identical. The disadvantage of using a lubricant not the absolutely best for the bearing, is more than compensated for by the advantage of having comparatively few kinds of lubricants to provide and distribute.

Oils may be regarded as typical lubricants. Fatty oils, that is to say, oils consisting of the glyceryl salts of acids of the fatty and similar series, have been almost exclusively used until comparatively modern times. Since the rise of the petroleum industry it has been found that certain of the fractions obtained in distilling crude petroleum, which are intermediate between the light burning oils and the heavy pitchy residue, are excellent lubricants, possessing important properties which give them, in some respects, the preference over fatty oils; they are, accordingly, largely prepared and used. Of solid lubricants there is a considerable variety, the individual members of which are chiefly used where exceptionally heavy loads are to be carried, or where, as in outdoor use, a cheap lubricant that will not drain or be washed away, is wanted. Such are axle grease, cart grease, black lead, tallow and soapstone compositions.

For a fatty oil to be of use as a lubricant it is essential that it should be non-drying. Is is also desirable that it should not readily become rancid, as during the change understood by the phase "becoming rancid," free fatty acids are produced, which have a corrosive action on metallic surfaces with which they are in contact. The soaps of the heavy metals thns formed are pasty substances of too sticky a nature to be serviceable as lubricants. Oils which will fulfill these conditions are sperm oil, neatsfoot oil, castor oil, and, in smaller degree, olive oil, tallow, and rape oil. The first four are specially free from tendency either to dry or to become rancid, and are, therefore, the best examples of their class. Choice between them depends on their viscosity or "body;" sperm oil being a light oil of low viscosity, which, however, it retains as the temperature rises, while neatsfoot oil and lard oil are of greater viscosity, but diminish in body with rise of temperature to a greater extent than does sperm oil. Castor oil is distinguished by its great viscosity, on which account it is used for lubricating heavily loaded journals. With regard to the remaining three, olive oil is a good lubricant if originally free from fatty acid, and not allowed to become rancid in use; rape oil is also useful on account of its high viscosity, the advantage of which compensates in great measure for the drawback arising from its tendency to gum. Tallow is esteemed for heavy loads and high temperatures, and is therefore used for cylinder lubrication, but is apt to be decomposed by high pressure steam, and consequently to yield fatty acids and their salts of iron, copper, by action upon metals with which it is in contact.—Chemistry for Engineers and Manufacturers, by Blount and Bloxham.

THE CUMMER PORTABLE SAND DRIER.

The drying of sand has become an important element in a number of engineering processes, and with special reference to the application of machinery to the drying and heating of sand used for asphalt, and for the preparation of crushed stone for contractors' use where stone is required in a condition similar to that of the sand, the portable apparatus shown in the accompanying illustration has been designed and constructed.



THE CUMMER PORTABLE SAND DRIER.

The apparatus consists of an all steel car 48 ft. long by 9 ft. 3 in. wide over all, upon which is mounted a Cummer drier, complete with its furnaces and accessories. A 25 horse power Westinghouse engine and the necessary elevating and power transmitting machinery is also provided. The car is equipped with automatic couplers, Westinghouse air brakes, and it, with the rest of the plant, has been passed upon and approved by the railroad officers. The drier and heater is of the same pattern as Cummer & Son's style "A," which is well and favorably known by users of this class of machinery, and is mounted and bricked in on top of the car in a very unique and substantial way. The fire brick, and in fact all the brick used, are put in place in such a way as to make it impossible to crack or loosen them. The bottom part of the furnace and combustion chamber, which constitute the lowest part of the drier, is above the level of the pilot of the locomotive, so there is no danger of trouble from this source, although this is not clearly shown in the engraving.

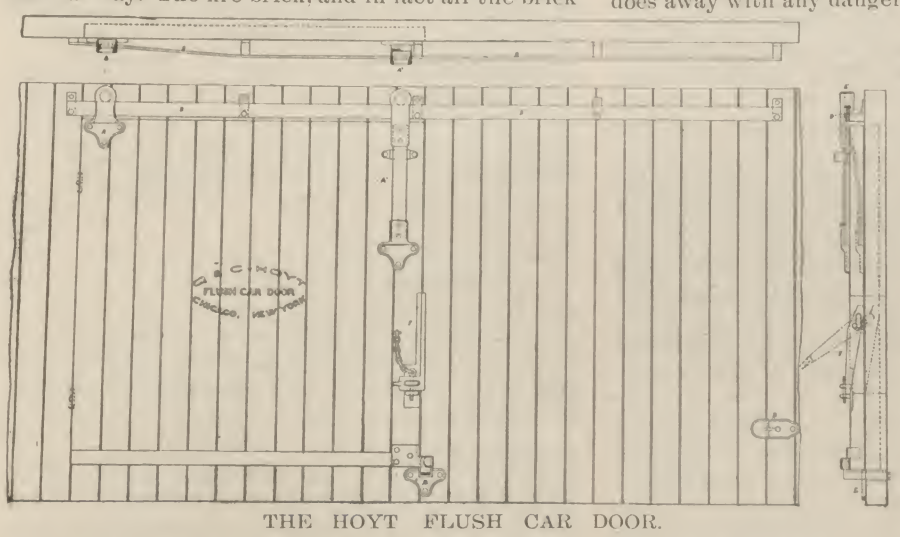
Two elevators are used in connection with the dryer, one to feed and one to deliver the dried and heated or simply dried material from the dryer the screen or any other point desired. The operator of the machine has full control over the temperature to which the material being treated is subjected, and it can be delivered, dried and heated uniformly to any temperature desired between 150 and 600 degrees Fahr. This engraving was made from a photograph recently taken of a plant built for a very large asphalt company, to be used by them as part of a portable plant. The sand drying and heating plant has capacity for turning out about 10 tons of sand per hour. The F. D. Cummer & Son Co. the builders are prepared to furnish these plants in several different sizes.

There has been a long felt need for such an apparatus as is shown here, and this is reported to be the only plant that has proven durable and satisfactory in design and construction, and capable of of doing the necessary work rapidly and economically.

WELDING LEAD.—An ingenious method of welding lead has been devised. The surfaces to be joined are carefully cleaned and between them is placed a thin layer of lead amalgam. On passing an ordinary soldering iron along the line of junction, the mercury of the amalgam is vaporized, and the lead, set free in an exceedingly finely divided state, fuses and unites the two surfaces together.

FLUSH CAR DOOR.

The accompanying drawings show the new Q & C Hoyt flush car door, which is being brought out by the Q & C Company. It will be noticed that there are several new features embodied in this door that are worthy of careful investigation, the first of which is an absolutely flush door, hanging from the top without a bottom rail of any kind. This entirely does away with any danger of injury to the door at this point, besides materially reducing the weight and number of fixtures. The parts needed at the top of the door are two hangers, the track and the track brackets, and the only parts used at the bottom of the door are a sliding guide bracket and a catch which recedes into the sill of the car as the door closes. This is a novel feature in itself, which has been demonstrated to be thoroughly practical, as nothing projects from the side of the car to be knocked off. The locking device at the rear edge of the door is of such a design as to make it necessary to break the seal before the car can be entered. Besides this it acts as a leverage to throw the door into place and hold it there. The power of this lever is so great that it will throw a badly sprung door into its place with but little effort, making an absolutely stormproof door. The claims made for this door are that it is cheap in first cost, easy to apply, and that the cost of maintenance will be low.



THE HOYT FLUSH CAR DOOR.

THE RAILWAY REVIEW

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CHICAGO, SATURDAY, JUNE 13, 1896.

DURING the past few days mill men have received inquiries for bridge and structural steel, car wheels, axles, plates, pipe material, etc., from several large consumers, asking prices on supplies to be contracted for before the close of the month. The advance in structural material and the apparent hardening tendency in Bessemer pig, coupled with the probability of considerable July buying on the part of the multitudinous small shop, factory and foundry interests, has led to the apprehension among certain large consuming interests of stronger midsummer prices. Our enormous capacity in steel making is protection against this unless something phenomenal should arise. The markets generally are quiet and prices in most lines incline to weakness. Railroad requirements are of moderate proportions. So far as specifically known, pig iron has declined to a price where banking or blowing out is preferable to further reduction; middlemen still have billets to sell. Repairing requirements for steel rails are heavier. Several large building concerns want to know lowest prices on large supplies with options to extend to July 31. Manufacturers express the belief that within a few weeks they will be able to withdraw some of the extremely low quotations of the past month.

A CONTEMPORARY, published in New York, recently commented upon the action of a department official of a neighboring city in requesting that college graduates should be excluded from competing before the local civil service commission for a vacancy in the office of superintendent of telegraph lines, the only explanation offered being that practical men of ability and experience were required for such positions. This request illustrates two things; first, that the political appointees who have been filling such positions are becoming alarmed lest they should be replaced by men of education regardless of the influence which they command, and second, that there is sufficient ground for the criticism of college graduates as not possessing the characteristic of practicability to give a certain amount of credibility to the objection offered by this officer. That college graduates may not be or become practical men is not to be admitted, but that they are made more valuable in the art of handling men and in digging their way out of difficulties in practical work through their education alone, is equally untrue. This instance serves to indicate the desirability of urging graduates of technical schools not to fail of obtaining the equally important achievement of knowing how to construct from their plans. No information is given as to the results in the case in question, nor is this necessary in order to emphasize the importance to students of being considered "practical men of ability" as well as good planners of work. The large increase in the numbers of graduates of technical schools renders this subject worthy of considerable attention.

SOME time ago a paragraph was published in the editorial columns of this journal critising the wastefulness of the method of shop management which permitted the whole of the line shafting of a large shop to be run during the night or at other times when it was found necessary to work a single machine or several machines overtime, and at that time the employment of an electric motor was suggested for such purposes, attention being called to the advisability of doing this by the presence of a well equipped electric plant in the same building in the shops under consideration. It would be a simple matter to arrange a motor upon a truck which would permit of its being moved about the shop and coupled to any machine where it might be wanted. The presence of an electric lighting plant is all that is necessary to insure economy in this way, as the wiring even need not be permanently fixed unless the overtime work occurred frequently. It would not be advisable to attempt at present to do away with belts for continuous use, but such special applications of motors seem well worth trying. Many shops, however, are not equipped with electric lighting plants, and yet in almost every locomotive repair shop it is frequently necessary to run certain machines overtime. In one such case which has recently come to our notice an excellent plan has been worked out by which pneumatic power is to be applied to this work. A small two-cylinder steam engine is mounted upon a truck which may be taken to the machine which is to be run after the main engine has been shut down, and after the belting from the machine to the engine on the truck an air hose is connected and the air compressor for the works takes the place of the dynamo, the use of which has been urged. Engines operate with perfectly satisfactory results by compressed air and this plan is worthy of imitation.

MUCH STUDY and experimental research has been devoted to the solution of the problem of obtaining electric energy directly by a combination of oxygen with carbon, and while many experimenters have taken up this work the results have lacked the important requisite of being commercially successful. A method has been devised by Dr. W. W. Jacques of Boston, however, which seems to be of unusual promise, and from which encouraging reports have been made by authorities whose reputations are well known. This process is described as the immersion of carbon in a bath of caustic soda, in a fused state, through which air is made to pass. The following is quoted from the specification for the patent application by the inventor: "I have found that if oxygen whether pure or diluted as in air, be caused to combine with carbon or carbonaceous materials, not directly as in combustion, but through an intervening electrolyte, the potential energy of the carbon may be directly converted into electrical energy instead of into heat." Dr. Jacques has fitted up a battery of one hundred cells which have been in operation for somewhat more than six months. These cells consist of iron pots twelve inches deep and one and one half inches in diameter. A recent test is reported to have been made by Messrs. Stone and Webster of Boston, in which this battery maintained thirty incandescent lamps of sixteen candle power at their full brilliancy for eighteen and one quarter hours upon a consumption of eight pounds of carbon. The average pressure during the test was ninety volts, and the current was sixteen amperes. The electrical energy actually obtained from the carbon consumed in the batteries was reported to be eighty-two per cent of the theoretical. No information is given as to the amount of fuel used to fuse the electrolyte or to furnish power for the pumping of the air. The invention is yet in a crude state as regards positive figures from which to judge of its commercial value, but Dr. Jacques work is so well vouched for by Professor C. R. Cross of the Massachusetts Institute of Technology and Messrs. Stone and Webster as to offer considerable encouragement for the belief that this phase of the process has not been neglected and that it will prove satisfactory. This development if successful will easily lead the electrical improvements of the times thus far.

TRUCK ARCH BARS.

Judging from the recent designs of freight trucks that have been illustrated in the RAILWAY REVIEW and other technical railroad journals, it seems as though it might be worth while for the Master Car Builders' Association to take up the subject of truck arch bars, and recommend sizes for cars of 60,000 pounds capacity. The committee on freight car truck frames recommended in 1893, that the association consider, among other other things, the question of "uniformity in dimensions (except length) of materials used in arch bars and tie bars." Their circular of inquiry brought out the fact that on twenty-three roads the "standard top arch bars were 1¼ inches by 4 inches, bottom arch bars 1⅛ inches by 4 inches and tie straps ⅝ inch by 4 inches. Eight members reported that they preferred the top arch bar to be 1⅛ by 4 inches, and bottom arch bar 1 by 4 inches and tie strap ⅝ by 4 inches. A few were using 1⅛ by 4 inches for top arch bars, and 1 by 4 inches for bottom ones, and ⅝ by 4 inches tie straps. All of the above dimensions were reported as being entirely satisfactory, and if such is the case, it is evident to your committee that some of the arch bars in use are excessive in dimensions and weight," The circular of the committee apparently failed to call out a reply from one of the prominent Eastern roads, which, for at least four years had used 1 by 4 inches top arch bars, ⅞ by 4 inch bottom arch bars and ½ by 4 inches tie bars. These dimensions also seem to have been satisfactory, as they have been followed in the construction of a large number of cars built within the past year. Assuming that they are of sufficient size, it looks very much as though most railroads were paying for and hauling about the country a large amount of useless material. It looks also as though many roads either guessed at the proper sizes or insisted upon a larger factor of safety than is really necessary.

In 1882, a committee appointed to investigate the strength of truck frames made quite a number of tests of frames then in use, and of others built expressly for the tests, they found the same wide variation in arch bar dimensions, but made no recommendations though they came to the conclusion that in a properly designed truck of ordinary proportions, the top arch bar should be heavier than the bottom one. In consideringthis report, it must be remembered that the committee dealt with lighter trucks, a shorter wheel base, 4 feet 6 inches and 4 feet 9 inches, and lighter arch bars than those now used. For these reasons, and from the fact that the majority of the trucks tested differed materially in several points of construction from those now commonly used under heavy cars, the report is not of great assistance to the designer of the present day, though no doubt it had considerable influence in the evolution of the freight car truck. There seems to be no doubt that the appointment of a similar committee for 1897 would result in a report which would help to bring about uniformity in sizes of arch bars and save some railroads quite an amount of money.

THE VALUE OF AN INSPECTION DEPARTMENT.

Apropos of the question of whether a railroad company is justified in making a considerable outlay for a well organized testing and inspecting department, and keeping in its employ a corps of experienced and trustworthy inspectors, the following incident, which has recently come to notice, may be put in evidence. What is here recorded happened upon one of the trunk lines, and on one which, if the general understanding of the conditions of its finance is correct, has reason to exert itself to make every possible legitimate saving. Several months ago the road, to which reference is made, placed an order for three hundred coal cars. The cars were built from designs and specifications furnished by the railroad company, and its regular inspection staff at the varions mills inspected the material used in their construction. Recently while a loaded train of these cars was being hauled over the road, an axle broke under one of them and sixteen of the cars were piled in a heap, wrecked. It was ascertained what firm made the broken axle and the records in the testing department of the railroad disclosed the rest of the facts which are mentioned.

The specifications of the railroad for axles require that the heat number shall be stamped on each axle and that one axle shall be taken from each heat for test, the disposal of the remaining axles in each heat to depend upon the result of the test of the one axle.

At one inspection of the axles in question three hundred of them were offered by the forge company, the manufacturers, on none of which the heat number was stamped. The inspector had the axles arranged in six piles of fifty axles each, and one was taken from each pile for a test, the disposal of the remaining ones in each pile to depend on the result of the test of the representative axle from the respective piles.

Of the six axles tested, three withstood successfully the prescribed test and three failed. As a result, the inspector felt justified in questioning the quality of the entire lot and rejected them. His decision was approved by the superintendent of motive power, and the company which was building the cars was notified not to use the axles. For some reason, however, the axles were used under the cars with the results stated; but by whatever means or for whatever reason, the fact remains that the drop tests indicated clearly that the axles ought not to be used. That they were used and that the wreck occurred, caused by the breakage of one of the axles, is one of the strongest and most direct illustrations which has come to our notice of the saving which a good testing and inspecting department may be expected to accomplish. For the satisfaction of the officers of the company which built the cars, four or five axles have been removed from the cars, since the accident and subjected to the regular drop test, and as a result of these tests the car building company will remove all the axles from the entire lot of cars and replace them with axles which pass the regular test.

What will become of the twelve hundred axles which are removed from those cars? The question should be a most interesting one to those managers who think that money expended for a testing and inspecting department is so much money wasted, and also to those who have been curtailing the expenses of the inspection of material which is used in car and locomotive construction. The necessity of close watching of material is increased by the increased capacity of cars, and it may prove int resting to note that on a road once equipped with a well appointed test department which has been abandoned for several years, the fact of the necessity for this department has become apparent, and the laboratory is again being put upon a working basis. This road, like many others, is under the necessity of saving money to the best of its ability, and here is an example of the recognition of practical laboratory work and inspection as a good investment. The idea of inspection may be carried too far, but that careful examination of material by inspection and by test upon a testing machine which is necessary to ascertain positively whether the requirements of safety are complied with, is what is urged here.

THE CAR FERRY QUESTION.

While the car ferry in its legitimate field constitutes a valuable adjunct to the railway system of the country, it is capable of being made to do much harm. Starting with the simple object of affording means of crossing streams without building a bridge on the one hand, or breaking bulk on the other, it has grown to the dignity of a movable permanent way upon which cars are transported over long distances and at comparatively small outlay, so far as the matter of construction is concerned. It is no doubt a difficult question to determine the exact point at which a car ferry service transgresses its legitimate function. For its employment in trans-river service there is undoubtedly abundant cause. The bridging of navigable streams is not altogether free from objection. Waterways and those who navigate them are possessed of rights which should not be too lightly regarded, and there is no doubt that under the plea of facilitating the movement of commerce, obstructions have in some cases actually resulted. Not that this result has in any degree equalled the converse of the proposition. The consent to the building of many a bridge has been withheld, and in many cases where bridges have been built, restrictions have been made that, commercially considered, were alike harmful and absurd, all for the alleged purpose of maintaining a commercial channel the traffic over which was comparatively infinitesimal. Nevertheless the proposition holds true that in some cases bridges have been built where the combined water and rail commerce could have been better served by the employment of the car ferry.

A legitimate extension of the car ferry may properly include trans-lake service under certain conditions. Commercial activities as at the present organized depend for their successful conduct upon regular and uninterrupted transportation facilities, and no through transportation line can hope for long continued success unless it is able to fulfill these conditions; and it follows that if the service is liable to interruption from storms or cold, together with the possibility of the entire loss of boat and cargo there is little hope that it will occupy a sufficiently high place as a commercial factor to permit of its continued maintenance with profit. Evidence to support this statement can be easily found. Several car ferry lines have been established in this particular connection, but it is doubtful if their projectors have realized any large amount of profit therefrom.

A third phase of the car ferry question is in its substitution for rail service over long distances, a notable example of which is found in the car ferry line established by the Wisconsin & Michigan Railway, which proposes to transport loaded cars from Peshtigo to Chicago, a distance of nearly two hundred and fifty miles. This line, in conjunction with a railroad fifty miles in length, proposes to compete with all rail lines on business to and from the northwest, and unfortunately it finds some of the officials on such rail lines timid enough to regard its actions as constituting an absolute menace to this traffic. To demand recognition as a legitimate competitor for such traffic is good business policy on the part of those back of this latest development of the car ferry; but to grant such recognition by the rail line is to throw open the door for all sorts of absurd demands.

It is probable that until railroad construction is restricted by law to cases where actual need of transportation facilities can be shown to exist, speculative enterprises will continue to flourish. It is of course not known that the particular scheme under discussion is of such character, but it is abundantly certain that existing roads would find it more economical to buy the Wisconsin & Michigan with its car ferry attachment than to fight it. But even admitting that the road was built with the idea of forcing its purchase, it may be asked: Why is not such a project legitimate? To this it may be answered, that public transportation cannot properly be made a plaything for the sake of private gain, nor can it, because of its power to demoralize rates, properly be used as an instrument of blackmail. Stable transportation charges are necessary for the safe conduct of commercial enterprises, and anything that tends to disturb this quality is an offence against the public to a much greater degree than against the carriers. It is to be hoped that in the growth of the movement in connection with railroad regulation, the danger attaching to the construction of unnecessary transportation lines will soon be perceived, and the necessary steps to prevent such construction be early taken.

POWERS OF RAILROAD RECEIVERS.

[The subjoined article, taken from the Financial Chronicle, so well expresses the attitude of this journal on the subject treated, that it is reproduced in full for the benefit of our readers.—ED. RAILWAY REVIEW.]

We have often spoken in disapproval of the practice which has been allowed to grow up in recent years, in cases where courts are in charge of embarrassed railroads, of the court undertaking the construction of new road or extensions, either into territory already occupied or into new territory. We have also expressed doubts as to whether the courts were not going beyond their legal powers when they authorized the building of such new road and the issue of receivers' certificates therefor. It appears that the practice is again being revived, or at least that it has not fallen altogether into disuse. Down in Texas and the Indian Territory a United States court has authorized what amounts to the construction of an entirely new road. The case we have in mind is that of the Denison & Northern Railway. This is a road projected to run through the Indian Territory into Texas. Information regarding the status of the property is rather meager. Construction appears to have been under way for some years, with very little actual work done however, and in November last Judge Kilgore, at Ardmore, in the United States court for the southern district of the Indian Territory, on a motion made by the attorneys representing the creditors of the road, placed the property in the hands of a receiver, Moran Scott being appointed such receiver. Now the court has authorized and directed said receiver "to proceed with the construction and equipment of the said Denison & Northern Railway from Dougherty, I. T., on the Gulf Colorado & Santa Fe Railway, easterly to a point near Coalgate, in said teritory, and from a point near Pennington, in said territory, on the line of said Denison & Northern Railway, south to the Red River near the city of Denison, Texas, the lines so to be constructed being about 104 miles."

For the purpose of carrying on this construction work the receiver is empowered to issue receivers' certificates at the rate of $11,000 per mile, said certificates to be issued "at the par value thereof," to bear 6 per cent interest per year, and to be payable January 1, 1897, to be secured by a lien upon all the rights, franchises, equipment and appurtenances of every kind, "with right of priority over all other claims except those of complainants in this cause," and to be registered by the clerk of the court. The order also specifies how the road is to be built and equipped. The track is to be laid with 60 lb. rails, there are to be six 10-wheel freight engines, ten box cars, four cabooses, 250 gondolas each of 60,000 lbs. capacity, ten hand cars and repair tools therefor, telegraph and telephone lines, switches, stations, water tanks, etc., etc. It is provided that the work of construction shall be completed by the first of January, 1897.

No timetable for the road appears in the Official Guide, nor is the name of the road given in the last report of the Texas State Railroad Commission, and the concern evidently has no mileage actually in operation. It is thus manifest that the whole of the road is to be built by order of the court, and that the court is also to provide the means to build it by the issue of receivers' certificates. There was some opposition to the action taken, but it was directed not against the idea of building the road but against giving the work to the party with whom the receiver was directed to make the contract. It appears that there are two factions in the property, and that each has been striving to prevent the other from obtaining the contract, the Mineral Belt Construction Company finally being successful in securing it.

We can not but think that action of this kind on the part of the courts is very objectionable and mischievous, and utterly unjustifiable. The accepted theory has always been that when a court, at the instance of the creditors of a road, intervenes and takes possession of a property, it is simply with the purpose of holding the assets for the benefit of those who in due course may be found entitled to them. To protect these assets and also to maintain a road's public functions by keeping it in operation, it may be necessary at times to issue receivers' certificates; but upon no other ground can the incurring of obligations by the court be defended. If the court has any duty in the matter it is to liquidate existing liabilities, not to create new ones. Nor is it part of the functions of a court to undertake new construction work. We can conceive of a road in process of construction becoming embarrassed just before the work of construction has been completed, or when the road has been carried to within a short distance of an important city, and when, therefore, it might be desirable for the court, in the interest of all parties, to take the few remaining steps necessary to permit of the operation of the line to advantage. But the present is a case where no part of the road is in operation, but where the court undertakes to build the whole line.

We know nothing regarding the merits of the enterprise. It may be that the road will prove to be a paying concern after it is built. But whatever the probabilities, that is an element that cannot be allowed to enter into a consideration of the matter at all, or that has any bearing on the question. If it could be shown beyond all doubt that the completed road will prove a success we should still think the court subject to criticism for ordering its construction and authorizing the issue of a large amount of certificates for the purpose. According to our thinking those engaged in building the line having failed, and the assets having come into the hands of the court, the one duty of the court is to close up the af-

fairs of the concern as speedily as possible and see that these assets pass to those entitled to them.

Of course it by no means follows that the certificates can be sold. It is one thing to issue the certificates, quite another thing to find takers for them. Though having the sanction of the court and put out by its express authority, the certificates have of course no value except such as their lien on the proposed road gives them. There are not lacking instances where receivers' certificates on embarrassed roads, issued for one purpose or another, have proved worthless, and those who have invested in them have lost their money. The prudent investor will keep that fact constantly before him. At the same time it is impossible to deny the obligations issued by authority of a court appear to many to possess elements of strength wanting in mortgage bonds secured on precisely the same property. In this sense the action of the court in authorizing the certificates is additionality objectionable because likely to mislead the uninitiated as to the security back of them. The order of the court expressly provides that the certificates shall be registered by the clerk of the court, and on the back bear his signature and seal. We all know that under such circumstance the order and seal of the court are apt to be given by some persons a value and an importance which they do not really merit.

It is quite conceivable, too, that those who have induced the court to approve the scheme have had this purpose and advantage in view: that is, they may think that it will be possible to float receiver's certificates when no purchasers could be found for the bonds of the road. The master to whom the application for authority to build the road and issue the certificates was referred, reported, we notice, that the construction company to whom the contract has been awarded is able to carry out and complete the contract. At the same time one cannot ignore the fact that last year in May a contract for building the same piece of road was given to a firm of contractors, and that only six months thereafter it was found necessary to have recourse to the courts and ask for the appointment of a receiver.

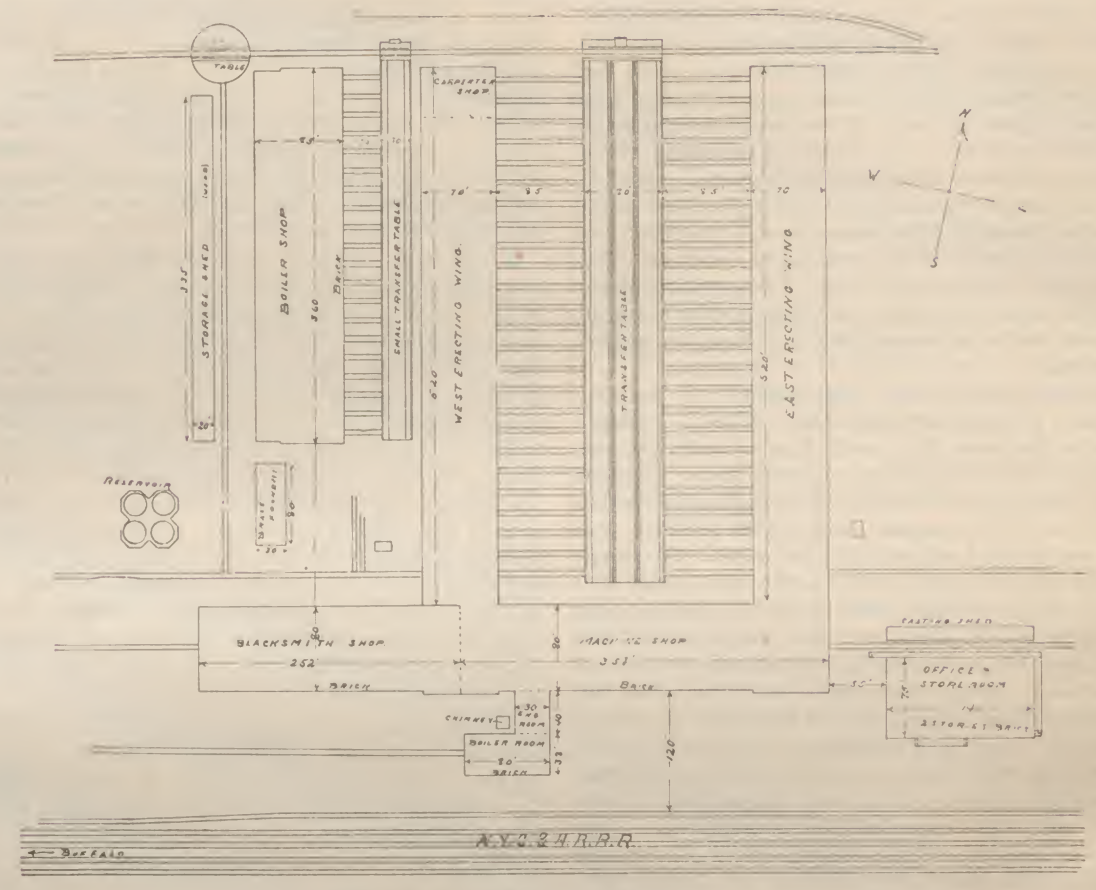
We refer to this case simply to show the need for a reform in the practice of the judiciary in the particular mentioned. There is absolutely no warrant for courts going into the business of building railroads—it is wholly at variance with the theory and doctrines underlying the subject of receiverships; and our federal judges, above all others, should be careful not to overstep the boundaries, but to discountenance the use of the courts for any but their legitimate purposes.

THE DEPEW SHOPS—N. Y. C. & H. R. R. R.

In a recent number of New York Railroad Men, a description of the shops at Depew on the New York Central & Hudson River Railroad was given by Mr. William Buchanan, superintendent of motive power and rolling stock of that road, from which the following description and illustrations are taken. The shops are located about 10 miles east of Buffalo, and together with the works of the Gould Coupler & Union Car Companies and several smaller plants, form the nucleus for the village of Depew. Fig. 1 shows a plan of the principal buildings of the works which are seen to be situated just north of the main tracks. It will be seen that the east and west wings, containing the erecting floors, are at each end of the machine shop, which connects them with each other. The blacksmith shop is on the left of the machine shop, and north of it lies the boiler shop. This disposition of the buildings insures well-lighted interiors, and puts a greater part of the works under one roof. The engine and boiler house lies between the track and the machine shop and opens into the latter. The office and storerooms are in a separate building east of the machine shop.

The office and storerooms are located in the southeast corner of the plant and are given a two-story brick building along the north side of which is the casting shed. To the west of this building are the machine and blacksmith shops and the boiler and engine rooms, all the buildings being of brick. Fig. 2 gives a general view of the blacksmith and boiler shops, and also the boiler and engine house may be seen next to the chimney and the office building is at the extreme right.

Although the wings of the erecting shop are of the same dimensions, the one next to the boiler shop accommodates three less engines than the east one, which has 24 stalls. This difference is due to the encroachment of the carpenter shop which is located in the end of the former. In the rectangle enclosed on three sides by the machine shop and the two wings, is an electric transferring table 80 ft. long and 200,000 lbs. capacity traveling upon a track half



DEPEW SHOPS—FIG. 1.—GENERAL PLAN.

way between the wings. By means of this table engines are placed in or taken from the stalls in the wings. In the erecting wings, the engines upon their entrance are stripped of their parts, which are labeled and taken to their respective places for repairs. When these have been completed, the parts are collected and the engine put together. Each stall accommodates one engine.

A Morgan electric crane of 68 ft. span and 80 tons lifting capacity, shown in Fig. 3, travels over the entire length of each wing. The two hoists which do the lifting are mounted upon separated carriages and have a motion backward and forward upon the body of the crane at right angles to its travel. Not only are these cranes used for lifting, but also for transporting heavy pieces, such as boilers, cylinders, drivers, etc. Cylinders are bored and valve seats faced by electric motors mounted upon trucks. For drilling and reaming holes in frames and boilers, Moffat pneumatic drills have been used with great success and to a large extent have displaced rachets.

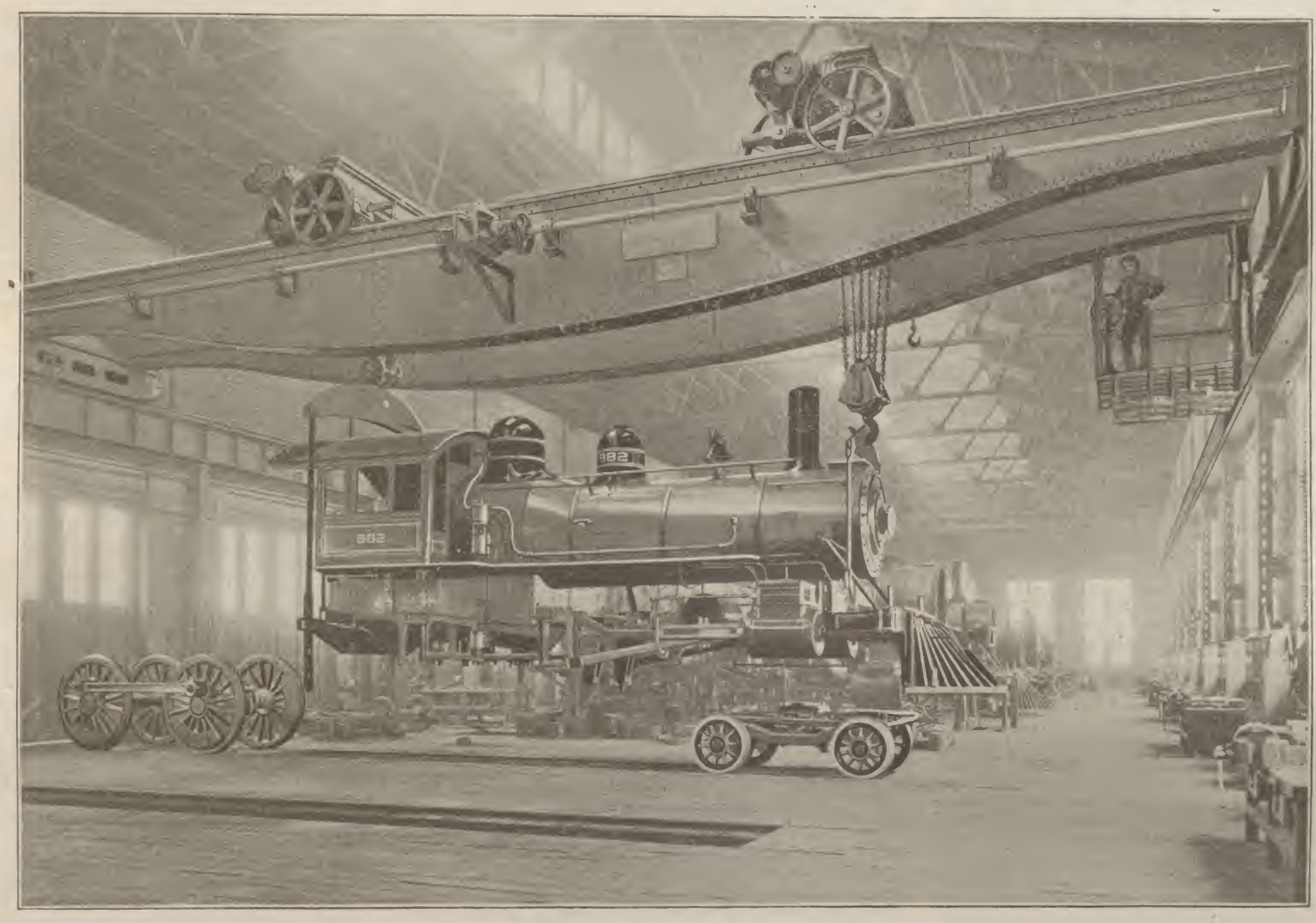
In the machine shop, besides the machine tools, there are two sets of benches. One set is reserved for the repair of engine accessories, such as injectors, gages, the air equipment, etc., while the other is devoted to rod and valve repair work. The machine tools occupy the space between these two sets of benches, and are arranged on either side of a middle aisle, the larger ones being on or near the aisle, and the others further away. There are a number of special tools, a few of which will be mentioned. Entering at the end towards the storeroom, one first sees four 90 in. driving wheel lathes and near by two 60-ton hydrostatic presses, by which axles and crank pins are forced into the wheel centers. A little further along are two vertical Bement & Miles mills (84 in. 72 in.), upon which tires, wheel centers, driving boxes, etc., are turned and bored. Another large tool is a 60-inch Bement & Miles planer (30 in. table) for cylinders, frames and similar work. This set of heavy machines is completed by three Bement & & Miles slotters, 18 in., 16 and 13 in., and are employed constantly with a variety of work—from frames down to eccentric forks. Among the lighter tools, the first in point of usefulness are two 37 in. vertical mills by the Bridgewater Machine Tool Co. The excellent design and wide range of adjustment of these machines renders them capable of doing a great amount and variety of work, such as driving boxes, cylinder heads, rod brasses, etc. The choice of the second important machine lies between a Pedrick & Ayer, 25 x 8 in., open side planer, and a horizontal Bement & Miles No. 2 borer. The former is confined to no particular duty, but does anything that is too large for the shapers or too small for the planers. The borer fills the gap between the drill

DEPEW SHOPS—FIG. 2.—VIEW FROM SOUTHWEST CORNER OF WORKS.

presses and the boring mills. It bores rocker boxes, the solid side rod ends, lifting links, etc.

The blacksmith shop is really an extension of the the machine shop, and is separated from it by a brick partition. Its equipment consists of 20 forges of different sizes, one Bement & Miles 2,500 lb. steam hammer, two smaller ones, a Brady cushioned hammer and a bolt machine. There are also a case hardening furnace and two spring furnaces.

The boiler shop is very similar in its interior appearance to the wings. It differs from them in that it is shorter, is not continuous with any of the other shops, and has a shed-like addition alongside. Provisions have been made for an overhead crane, but he crane itself has not been installed The main



DEPEW SHOPS—FIG. 3.—MORGAN ELECTRIC CRANE IN ERECTING SHOP.

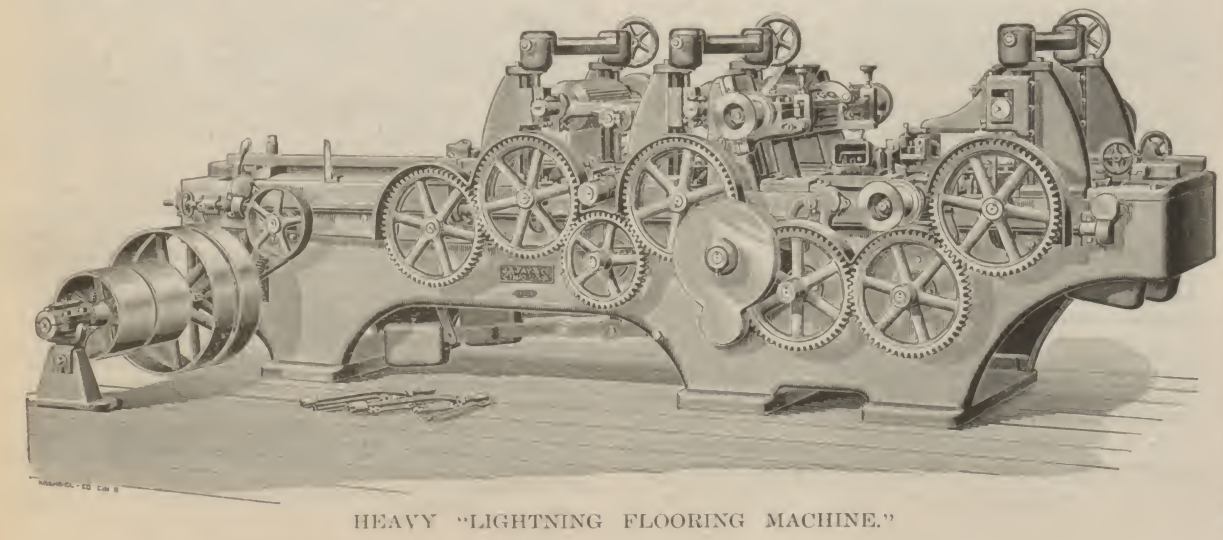
part of this shop is occupied by 18 stalls for engines whose boilers are undergoing repairs. Access to the stalls is had by a small hand-operated transferring table between this shop and the west wing. Among the special tools are a four-spindle tube sheet borer, a 16 ft. Bement & Miles planer—cutting on both the forward and return stroke—a Hartz flue welder, an 8 ft. 3 roll bender and a Bement & Miles steam riveter of 96 in. throat.

Tracks in and about the works from the main line make it possible to reach any point by rail. All the shops are heated by steam and lighted by electricity. Special compressed air appliances are being gradually introduced. Besides the drills already mentioned, there are a 10-ton rod brass press and a number of hoists (some mounted on short overhead tracks) of 500 or more capacity.

When running full force, between 600 and 700 men are employed, and the shop capacity is about 75 engines per month.

HEAVY "LIGHTNING FLOORING MACHINE."

The accompanying illustration shows the general appearance of an extra heavy six-roll type, triple cylinder "lightning" flooring machine manufactured by J. A. Fay & Co., of Cincinnati, O., which is particularly designed for the hard continous service of car building establisments where the maximum output is the main result looked for. The frames are massive and all parts of the machine are designed to be of sufficient strength to withstand any strains from heavy work without springing. There are three cylinders, 9 and 15 in., made from solid steel forgings, and having four planed sides so that either two or four knives may be used as required; chip ieakrng lips are provided for working cross grained lumber. The journals are $2\frac{7}{16}$ in. in diameter lead ground and run in long and heavy bearings. The bearings for the upper cylinder are carried in a frame which is carried in grooves formed in a part of the bed. This construction, together with the fact that the cylinder is driven by two belts insures the bearings always remaining in line and reduces the danger of heating to a minimum. Bits may be placed on the cylinder for hollowing out on hardwood flooring. casing, etc. The matching heads are heavy and substantial. The arbors are of steel $2\frac{3}{16}$ in. in diameter and running in long self-oiling bearings, both of which are adjustable laterally. Each head is provided with a gage marked in inches and fractions for facilitating their adjustment to material of different widths. The matcher heads are made of gun metal and are fitted with patent solid milled matching cutters so arranged as to make a deep rabbet for drop siding. The Shimer patent matcher heads can be



HEAVY "LIGHTNING FLOORING MACHINE."

of material in working flooring, ceiling and beading. This guide is controlled by the operator from the feeding end of the machine, and with its aid a change may be made in the position of the guide and matcher heads in relation to the knives on the cylinder, thus avoiding the necessity of regrinding. The machine is one of the results of many year's experience in the manufacture of machinery of this class, and the company has received numerous awards and medals on it at expositions.

Engineers' Club of St. Louis.

At a meeting of the Engineers' Club of St. Louis held June 3, the committee to whom was referred the bill to establish engineering experimental stations throughout the United States, reported as follows:

"The attached bill provides for giving to each state and territory $10,000 a year, this sum to be increased by $1,000 annually for fifteen years, until the sum amounts to $25,000 a year for each state and territory, and to remain at this figure thereafter, for the purpose of providing for engineering experiments in these several states and territories. In other words upwards of $1,250,000 annually is to be donated by the general government for engineering experimentation in about fifty different laboratories, most of which are now and would remain in relatively incompetent hands.

"There is now expended for experimental work on the strength of materials at the Watertown arsenal the sum of $10,000 per annum, and this small amount has proved sufficient for many years to maintain that work on a high plane of accuracy and efficiency. It seems hardly possible that the proposed large sum could be profitably spent in fifty different educational institutions, with anything like an adequate return to the cause of scientific experimentation. If engineering experiments are carried out by inexperienced and incompetent persons, and the results published by the general government, as is here proposed, these results are likely to be more or less erroneous and misleading, and might prove to be of more injury than benefit in engineering practice.

"In the opinion of the undersigned, this bill is an example of many that are now urged upon congress which are consistent only with a more highly paternal form of government than our has yet become.

"It is recommended therefore that no action be taken on this bill by the Engineers' Club of St. Louis."

Respectfully submitted, J. B. JOHNSON,
Committee.

On motion ordered that the report be received and adopted.

The secretary then read the following letter from the secretary of the American Society of Mechanical Engineers.

"Engineers' Club of St. Louis:

Gentlemen—"The American Society of Mechanical Engineers at a session held just held previous to adjournment of its most successful St. Louis convention passed unanimously the following resolution:

"Resolved: That the hearty thanks of the society be tendered to the Engineers' Club of St. Louis and especially to its honored president, Mr. J. A. Ockerson, for the courtesies extended to the society in the tender of the use of its comfortable house and valuable library during our stay in the city.

"You will permit me to add a personal expression of the indebtedness of the society to the club for attentions which it is not possible to recognize in formal and public resolution. Be assured, however, that because of the very nature of this cooperation, which had so much to do in making our meeting a pleasant memory, that I venture to add a word of personal recognition to the club and its members individually. Yours truly,

F. R. HUTTON,
Secretary.

On motion it was ordered that the secretary extend the thanks of the club to the Cupples Real Estate Co., Capt. Robt. McCulloch, and the Anheuser-Busch Brewing Association for entertainments and courtesies extended on the afternoon of Friday, May 22.

Mr. F. B. Maltby then read a paper on "Methods and Results of Stadia Surveying," treating the subject from the standpoint of a wide practical experience. He went into the details of the work at some length regarding the appliances necessary, force required, necessity of sketching, speed with which such work could be conducted, and the cost of same, showing some charts from actual service. Mr. J. L. Van Ornum contributed a written discussion which was read by Mr. E. J. Jolley. Messrs. Colby, Thomas, Turner, Jolley, Ockerson and Russell also took part in the discussion.

Mr. Julius Baier showed the club a number of photographs showing the damage done by the recent tornado, and discussed it from an engineering standpoint. An informal discussion followed participated in by nearly all present, after which the meeting adjourned.

WM. H. BRYAN, Secretary.

"Manila Rope" is the title of a forty page pamphlet, just received from the C. W. Hunt Co., of 45 Broadway, New York, in which is given a brief treatise for engineers on the subject of ropes used for the transmission of power and ropes used for hoisting and other purposes, together with formulæ, tables and data, which have been found use ful in mill engineering. The material is presented in an interesting manner, and the illustrations, some of which are diagrams and others are from photographs, give an excellent idea of the methods of employing ropes, method of construction, a good idea of the materials employed, and much valuable theoretical information, which will be found convenient for those who are using this form of transmission. The pamphlet contains four appendices, the first upon rope driving, taken from a paper by C. W. Hunt, which was read before the American Society of Mechanical Engineers, and appearing in the Volume XII, page 230 of the transactions of that society. The second is a reprinted article from Engineering of London, March 29, 1893, entitled "The Power Absorbed by Rope and Belt Transmission." The third gives the results of tests by Robert Grimshaw, for the United States navy, and the fourth consists of rope driving bibliography. This pamphlet is one which should be procured by engineers, as it is a valuable collection of data and principles governing the use of this form of transmission of power. The illustrations are good, the letter press excellent, and an index is provided. The only fault to be found, and that is a serious one, is that the standard size was not used.

TECHNICAL MEETINGS.

Annual convention Master Car Builders' Association June 17, Saratoga, New York.

Annual convention American Master Mechanics' Association, June 22, Saratoga, New York.

Association American Railway Accounting Officers, May 27, New York City.

Association Railway Telegraph Superintendents, June 17, Fortress Monroe, Va.

American Association General Baggage Agents, July 15, Philadelphia, Pa.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

Annual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896. W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association. Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

PERSONAL.

Mr. A. D. Lightner has been appointed to the position of general agent of the St. Louis & San Francisco Railroad, at San Francisco.

Mr. A. D. Norton, formerly auditor of disbursements of the Northern Pacific, has been made assistant general auditor of the same company.

Mr. W. L. Benham, late assistant general freight agent of the Michigan Central has been appointed to a similar position on the Great Northern.

Mr. Frank S. Jones, late superintendent of the Chautauqua Lake Railroad, has accepted the captaincy of the steamer City of Buffalo of the Chautauqua Steamboat Company's fleet.

Mr. John L. Evans has been appointed acting general freight agent of the Cleveland & Buffalo Transit Company, with headquarters at Cleveland, vice H. R. Rogers, who retired from that position June 8.

Mr. Joseph D. Brennan, for three years chief train dispatcher of the western division of the Lake Shore, with headquarters at Chicago, has been promoted to the position of trainmaster of that division, vice B. F. Arnold.

Mr. C. B. McCall, general freight agent of the Chicago Paducah & Memphis road, has been appointed general manager of the Litchfield, Carrollton & Western road, with headquarters at Carlinville, Ill., vice Mr. T. D. Hinchcliffe, resigned.

Mr. E. E. Gerkins has been appointed assistant general freight agent of the Michigan Central, with headquarters at Bay City, in charge of the Mackinac division, vice Mr. W. L. Benham, resigned. His successor on the Michigan Central will be Mr. J. E. Bailey, at present local agent of the road at Battle Creek.

Mr. J. A. Swayze has been appointed commercial agent for the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Detroit, Mich., vice H. J. Rhein, transferred to passenger department. For a number of years he has been agent for the Michigan Central at Bay City, a position which he resigned to accept the present one.

Mr. M. D. Royer, formerly traveling auditor of the Yazoo and Mississippi Valley route, was on the first of the month appointed chief traveling auditor for the entire Illinois Central system, with headquarters in Chicago. In his former position Mr. Royer was succeeded by Mr. C. C. Whitney, for some time agent for the same road at Helena, Ark.

On July 1 the Erie will remove its general freight offices from Chicago to Cleveland. General Freight Agent C. L. Thomas will not only retain his title, but will have jurisdiction over all that portion of the Erie system lying between Chicago and Buffalo and Salamanca—over 890 miles of road. Mr. Thomas will report to Assistant Freight Traffic Manager Shane.

Mr. Robert S. Logan, secretary to the vice president and general manager of the Wabash, has resigned that position to take a similar one with General Manager C. M. Hays, of the Grand Trunk. The position thus made vacant will be filled by Mr. George M. Burns, now fuel agent, who will continue to hold the title of fuel agent, but will virtually be the assistant to the general manager.

Trainmaster Murray B. Augur of the Lehigh Valley has been transferred from the Elmira, Cortland & Northern division to the Buffalo division, with headquarters in Buffalo, to fill the vacancy caused by the promotion of Mr. L. H. Van Allen to the office of superintendent. Mr. Augur was formerly secretary to General Superintendent Wilbur. His successor on the Elmira, Cortland & Northern is Mr. Leonard Goodwin.

Mr. J. C. Murphy is appointed roadmaster of the Eastern division of the Louisville, Evansville & St. Louis, with headquarters at Huntingburg, Ind. His supervision will extend over the main line from New Albany to the west end of the Huntingburg yard and over the Evansville division and branches. Mr. G. R. Truville is appointed roadmaster of the Western division of the same road, with headquarters at Mt. Vernon, Ind. His supervision will extend over the main line from Huntingburg yard to East St. Louis.

Mr. D. B. Robinson, first vice president of the Atchison, Topeka & Santa Fe, has been elected president of the reorganized St. Louis & San Francisco R. Co. He was the unanimous choice of the reorganization committee. As first vice president and for two years acting president of the Atchison, Topeka & Santa Fe Co., which up to last January operated the St. Louis & San Francisco as part of its system, Mr. Robinson became intimately acquainted with the needs and requirements of the property, and will now be able to utilize the experience heretofore gained to the best advantage of the owners of the property. Mr. Robinson has been in railroad service since 1866, when he began as freight clerk in St. Albans with the Vermont Central R. His rise has been gradual and honorable. For a short period he was general manager of the Atlantic & Pacific, then general manager of the Colorado Midland, subsequently assistant to the president of the Atlantic & Pacific, president of the San Antonio & Aransas Pass R., president of the Santa Fe, Prescott & Phœnix R. and first vice president of the Atchison, Topeka & Santa Fe R.

Mr. Henry B. Hammond, who for many years has been a prominent railroad man in various parts of the United States, died recently at Chestnut Hill, Mass. Mr. Hammond was graduated from the Harvard Law School in 1861, and at once went to Washington as secretary and aide to his uncle, General Mansfield, who was at that time in command of the troops protecting the national capital. Late in 1861 he was sent by President Lincoln to Dublin as United States consul, and during the critical three years of his consulship rendered great service to the country, and at the same time won the respect and esteem of the people to whom he was accredited. Upon his return to America he entered the office of Evarts, Southmayd & Choate and continued the practice of law in New York till 1881, being in partnership at various times with Judge James Emmett, Albert Stickney and General H. L. Burnett. The greater part of his time since 1870 has been given to the organization and management of railroads. He was secretary and attorney for the Union Pacific from 1867 to 1873; he became president of the Indiana & Illinois Central in 1871; in 1874 he was made general manager of the Boston & New York Air Line, and in 1881 its president; he was receiver of the Chicago, Dansville & Vincennes Railroad; in 1881 he was president of the Continental Construction Co.; in 1891 he was president of the New York & Long Island Railroad. Mr. Hammond was a recognized authority on matters pertaining to railroad history and construction and had one of the best railroad libraries in the United States. He had a stroke of paralysis in 1893 and since that time has practically retired from business.

General John B. Gray, vice president of the American Brake Co., of New York, and whose home for several years has been in Brooklyn, N. Y., died of Brights disease at Asheville, N. C., on June 6, 1896, after a lingering illness.

General John Burritt Gray was born at Sheridan, June 25, 1831. The beginning of his business career was in New York City, but, on becoming of age, he removed to St. Louis, Mo., where he was engaged in mercantile business for some ten years prior to the war.

During the summer of 1861, he was associated with Generals Lyon, Schofield and Frank P. Blair, in organizing and drilling the loyal men of the state of Missouri. In November of that year, he accepted a staff position with General Halleck as lieutenant colonel and aide-de-camp, and was assigned to duty with General Schofield. In the summer of 1862 he was commissioned colonel of the first regiment of the Missouri state militia infantry volunteers and also brigadier of the Missouri militia. He served with his regiment and commanded the first brigade of Davidson's district of Missouri,and was engaged in guarding and keeping open the St. Louis & Iron Mountain Railroad. In the spring of 1863, he accepted the position of adjutant general of Missouri, which he held until the close of the year. At the close of the war, General Gray presented to congress the claim of the state of Missouri for reimbursement of moneys expended on behalf of the United States, in supporting troops, and, after two years' work, succeeded in collecting and paying into the state treasury about $7,000,000 in settlement of that claim. In 867, he was tendered the appointment of postmaster of St. Louis by President Johnson, and later he was offered the position of auditor for the treasury department by President Grant, whose personal acquaintance and friendship he enjoyed. Both of these appointments he declined. In 1880 he became connected with the American Brake Co., of St. Louis, of which he was president for several years. Under his management the buffer brake of the American Company was perfected and the business developed into a most promising condition. With a keen business instinct, he was one of the first to see and admit the futility of further attempts to develop the buffer brake business, after the Burlington brake trials of 1886-7, in which the American Brake Co. was a competitor. Thereafter he bent his energies to the development of the outside equalized driver brake business of the American Company. He removed his headquarters from St. Louis to New York in 1885, withdrawing from the presidency of the company and taking the position of vice president, which he continued to occupy until his death. In 1888, he was instrumental in effecting a lease of the American Brake Co. to the Westinghouse Air Brake Co., and has, since that time, had general charge of the eastern business of the driver brake department of the Westinghouse Air Brake Co. During the past two years, his health has been continually declining. Last summer he went abroad for several months and, shortly after his return, he went to Asheville, N. C., where, the climate seeming to benefit him, he purchased property and commenced building a home, which was not yet quite completed at the time of his death.

RAILWAY NEWS.

Baltimore & York.—This is the name which will be taken by the road formed by the consolidation of the Baltimore & Lehigh and the York Southern, the plant for which was noted in this column in the issue of May 30. It is expected that the Baltimore & Lehigh will be at once converted into a standard gage road. The new company will be capitalized at $3,000,000.

Chesapeake, Ohio & Southwestern.—This road which has for some time been in the hands of a receiver appointed by the United States court will be sold by Messrs. Brown and Baskin as commissioners on July 25. The upset price has been fixed at $1,500,000, and the line will then go to the highest bidder, but the Illinois Central is certain to be the only one to bid for the property, as that company purchased a majority of the securities over a year ago. Even if any other corporation should want to get the property that line would have the advantage of having the bonds, and could afford to bid it up, but it is not thought there will be the least competition. The formal sale of the road will amount to nothing so far as the outside world is concerned. It has already been discounted by the amalgamation of the Chesapeake, Ohio & Southwestern by the Illinois Central. As the latter now stands there must be a separate account kept for the independent line, but after the sale it will be one of the branches of the great system. It is stated that the Illinois Central will spend about $400,000 this year in improving the roadbed and remodeling the depots. The 60 lb. rails on the track are being replaced with 75 lb. rails.

Grand Rapids & Indiana.—The Grand Rapids & Indiana system, with the exception of the Muskegon branch and the land grant, was sold at Grand Rapids, Mich., on June 10, at auction on an order of the United States court, as prayed for by the second mortgage bondholders. The decree was for $3,000,000 and interest. The only bid was by a representative of the Pennsylvania R. Co.,whose stockholders own the second mortgage. It was for $500,000, subject to the first mortgage of about $6,000,000. By this sale the holders of the third mortgage bonds exceeding $4,000,000, are left out in the cold.

Gulf & Interstate.—Ballasting of the track of the Gulf & Interstate railway, between Port Bolivar and Beaumont, is progressing rapidly, and it is expected to have the roadbed in such a shape by the 15th for the passage of trains at a speed of 25 miles per hour. The company has secured a full rolling stock equipment and anticipates doing a large lumber business for foreign export from Port Bolivar, where it will put in docks for this purpose. It will also put in a steam ferry between Galveston and Port Bolivar for the transportation of its cars. By July 1 it is expected full and regular traffic arrangements will be effected so that a train service at a speed of 30 miles can be established.

Gulf & Ship Island.—This company has applied to the secretary of war for permission to erect two piers, with four tracks on each, slips and inclines at Ship Island, and the necessary sidings on the island itself, so that loaded cars may be taken from Gulfport on transfer boats and placed on the piers at the island for the delivery of lumber. The total cost of the work will be $198,500. The railroad and its connecting pier and inclines at Gulfport will be completed by Sept. 15, and the company has assurances that all the lumber it can possibly carry will be supplied as soon as facilities for export are completed. With the piers and tracks suggested there will be storage room for 420 cars at one time, and one transfer boat, with a capacity of 20 loaded cars can deliver 1,000,000 feet of lumber daily. At the sea end of one of the piers the depth of water is 4½ fathoms; at the land end 22 feet; at the sea end of the outer pier the depth of water is 5 fathoms, and at the land end 4 fathoms. Each pier will accommodate four large ships at one time. It was hoped this matter would have been taken up by the government, but finding that it was not possible to have any harbor work done this season by the United States, the Gulf & Ship Island R. people decided to do the work themselves. Should the secretary of war consent, the work will be done promptly, and the company will be prepared to deliver on the piers at Ship Island 1,000,000 feet of lumber, board measure daily.

Houston East & West Texas.—Blair & Co. of New York has control of the Houston, East & West Texas R. by purchase of the stock and a large part of the company's bond issue. The purchasers will for nally take possession of the property this month.

Jacksonville, Louisville & St. Louis.—On June 10 at Jacksonville, Ill., the Jacksonville, Louisville & St. Louis was sold by decree of court and was bid in by the purchasing committee of the bondholders, who are mostly Philadelphia men. The road is in fairly good condition and it is said to be the intention of the purchasers to improve the equipment and place the property in condition to earn dividends, if possible. Messrs. R. F. Kennedy and J. F.Dunn were the committee for the bondholders. The price paid was $250,000, subject to the incumbrances.

LaFayette & Opelika.—The grading for the entire length of this line—22 miles—is now completed, the track is laid for a distance of 12 or 13 miles, and is already being operated. The work is being pushed, and it is hoped to have the entire track completed between LaFayette and Opelika within 90 days. The line is being constructed and owned entirely by the merchants and citizens of LaFayette. G. E. McGehee, LaFayette, Ala., is president of the road; J. R. McGehee, Opelika, Ala., is agent and general manager.

Macon, LaGrange & Birmingham.—The purchasers of the Macon & Birmingham have completed its reorganization changing the name to the Macon, La Grange & Birmingham. The stockholders will meet June 30 to authorize the issue of $500,000 of 5 per cent bonds, payable in fifty years, the bonds to be of $1.000 each. It is supposed that Messrs. Parsons and Edwards, who purchased the road at foreclosure sale, represent some railroad company or syndicate which does not desire to appear in the transaction. The officers of the road are as follows: Mr. F. M. Edwards, of Boston, president; E. C. Parsons, of Boston, secretary, and Julian R. Lane, of Macon, general manager. The directors are Messrs. L. F. Garrard, G. Y. Tignor, T. Crawford, of Columbus; Julian R. Lane, of Macon, and F. M. Edwards, of Boston.

Maine Central.—Improvements along the eastern division of the Maine Central are nov in order. A large crew of track layers have begun the laying of a double track between Bangor and Oldtown. All the bridges are wide enough to allow a double track with the exception of the one at Orono, where the two will join, the trains running through the bridge over one track. The work of enlarging the yard at the Exchange street station is nearing completion, there being but very little excavating remaining to be done. An iron span 100 ft. in length is to be placed beneath the Bangor end of the toll bridge, and two abutments, one about 15 ft. in hight and the other about 28 ft., are now in process of erection. Much of the material for the new iron bridge between Bangor and Brewer has arrived and work upon it will be commenced at once.

Minneapolis, St. Paul & Ashland.—The statement has been made that subcontracts for the entire line of the Minneapolis, St. Paul & Ashland road from Mason, where the present work ends, to St. Croix will be let inside of twenty days, and every contract will be let on the condition that the work be completed during this year. The road will run eighty miles beyond Hayward, where it will connect with the Soo and secure an entrance into Minneapolis and St. Paul over the latter line. The twenty-five miles of road being built between Ashland and the south shore at Mason is being rapidly completed, and it is expected that trains will be running from Mason to Ashland by July 15. Sawyer county, Wis., has voted to issue bonds to the amount of $70,000 to aid in the construction of this road from Ashland, Wis., southwest 150 miles to a St. Paul connection, and it is stated that 1,000 men are at work on the grade.

Northern Pacific.—Grading on the line which is being built to the Castle mining camp in Meagher county, is now in progress between Townsend and White Sulphur Springs. This part of the work is being done by local capitalists but as soon as the road has been graded the Northern Pacific will provide the rails and equipment thus making the line a virtual spur of the Northern Pacific. The opening or this branch will have the effect of opening several gold and silver mines at Castle, which have been practically abandoned because the wagon haul of 60 miles to the nearest railroad station made the working of the mines unprofitable. It is expected that trains will be running over the new branch by Nov. 1, and it is anticipated that the opening will turn Castle into an active mining camp, with plenty of life and business.

Among the plans which the reorganiza'ion committee is said to have formulated is one which provides for the enlargement and improvement of the road in and near Seattle. For the latter purpose $1,000,000 is to be raised, of which 500,000 is to be spent in carrying on the enlargement of docks and wharves already begun in Seattle, improving the mines, standarding the gage of the Columbia in Puget sound and other needed improvements.

Winona & Western.—A deed was filed on June 10 with the county register of deeds at Winona, Minn., transferring from H. W. Lamberton, V. Simpson and Matthew G. Norton, all of Winona, to the Winona & Western Railway Company, all of the property previously in possession of the Winona & Southwestern Railway Company. This consists of 117 miles of railroad line between Winona and Osage, Iowa, with all the trust, franchises and rights of the road, rolling stock and general property. The consideration named is $1,250,000.

NEW ROADS AND PROJECTS.

Canada.—Work on the construction of the St. Lawrence & Adirondack division between Beauharnais & Montreal, contracts for which were let last November, is being rapidly pushed forward, and the officials expect to have the track connections with the Canadian Pacific Railway at Caughnawaga ready for traffic by the middle of next month.

Mexico.—A state subsidy has been granted the Michoacan & Pacific R. Co. amounting to $3,000 per kilometer by the government of Michoacan for the construction of a railroad from Patzcuaro to the Pacific, something over 100 miles in length. The railroad in question is an English corporation.

A newly organized company known as the Mexican Industrial R. Co., has been incorporated under the laws of Colorado, to build an operate a circuit railway around the City of Mexico, to connect the roads entering the city for transfer purposes. The new line, which is to be built mainly by Boston capitalists, will connect the Mexican Central R., Mexican R. Ltd., Mexico, Cuernavaca & Pacific and Mexican Interoceanic R. and will interchange the traffic between the roads mentioned, and will also have the hauling of hogs and cattle as delivered, by the above mentioned roads, to the city's slaughter house, as well as large tonnage from the peatfields of Lake Xochimilco, to which a railway will be built later. In speaking of the enterprise the Mexican Financier says: "To provide money for the actual cost of the construction and equipment of the line it is proposed to issue 30 year 6 per cent bonds at 95, and with each $1,000 bond four shares of stock are to be given. At present only $150,000 stock will be issued. Mortgage will be secured by all the property franchises of the company and will be limited to $350,000. A valuable concession has been granted the company by the Mexican government for 99 years. The company is free from taxation and is allowed free importation of all articles of construction and supplies for 15 years. It also has the privilege of using electric power. About three miles of the road already have been constructed, and it is planned to have the entire line in operation by Sept. 30. Application is to be made shortly for listing securities on the Boston stock exchange."

Michigan.—The Frederic & Charlevoix road, which is being built by Mr. David Ward of Detroit, is now completed to East Jordan, and it is expected that trains will be running by July 4. This line was begun several years ago and finished and put into operation as far as Alba in 1894. It will be about 45 miles in length, is standard gage, and laid with 60 lb. rails. Mr. Ward owns 200,000 acres of land in this territory, which comprises some of the finest timber land in northern Michigan.

Missouri.—The building of the new route from St. Louis to the Southwest via Siloam Springs, under the name of St. Louis, Siloam & Southern, is said to be now assured, as contracts have already been let for the construction of a portion of the line. Back of H. D. Mackey, the promoter of the enterprise, it is understood, are enlisted the financial interests of H. A. Havemeyer of the Sugar Trust and Mr. McCurdy, another Eastern capitalist. One reason why this line which was projected sometime ago has progressed no forther is the uncertainty of the reorganization plan of the St. Louis & San Francisco. Should this road be put on a basis free from all alliances with the Santa Fe, it would then be essentially a St. Louis road, and the new line when built would be the strongest competitor the Frisco would have. For this reason St. Louis capital has been slow to invest in the new line. This restraint, however, was not felt in the east, and just as soon as it was apparent that the crisis in the financial affairs of railway corporations had been passed and that better times could be looked for, there was not much trouble experienced in getting Eastern capitalitists interested in the new outlet for business between St. Louis and Texas points via Fort Smith, Ark. The road, after leaving St. Louis, is to extend in a southwesterly direction through

Siloam Springs, near Pomona, in Howell county; Gainesville, seat of Ozark county; Harrison, seat of Boone county, to Van Buren and Fort Smith, Ark., a distrance of 211 miles. The distance between St. Louis and Fort Smith via the St. Louis & San Francisco road is 416 miles, and over the Iron Mountain via Little Rock 511 miles. The new line is laid out through a section of country abounding in mineral wealth, and it is on the claim that the development of the local business alone will defray the expense of operation that capital has been secured to put the road through. H. D. Mackey, president of the St. Louis, Siloam & Southern, is largely interested in the development of Howell county and owns considerable land in that vicinity. Ex-Governor W. M. Fishback, of Arkansas, is first vice president of the company, and has been working strenuously to secure its construction. The building of the road also includes the erection of a large hotel and sanitarium at Siloam Springs.

New York.—The New York & Brooklyn R. Co. of New York City, has been incorporated by the secretary of state to build and operate a tunnel railroad two miles long under the East River from a point on Broadway between Canal street and South Ferry, New York, to a point on Fulton street, Brooklyn, between the City Hall and the East River. The New York & Brooklyn R. Co. was originally organized in 1891, but active work not having been begun, as prescribed by the railroad act, the filing of articles of incorporation was to prevent the lapsing of charter. The directors are: Benjamin S. Henning, Alonzo B. Cornell. Otto Andreal, Jr., Fritz Hill, John D. Miller, Jr., Paul C. Schnitzler, E. R. Hoadley, Irving Washburn of New York City, and Sutherland R. Haxton of Brooklyn. The capital stock is $20,000, divided into 200 shares of $100 each, of which Mr. Henning subscribes for 186 shares. It is now proposed to push the scheme for a tunnel under the East River, and the Henning gravity system will probably be used.

South Carolina.—It is now said to be assured that the proposed Charleston & Macon R. will be built, as all of the $320,000 of bonds have been taken. The contracts for the construction have been let to the Security Construction Co., and call for the completion of the line as far as Allendale—about 80 miles—within four months. At this point a junction will be made with the Greenwood, Anderson & Western road. This line is now being extended to Greenwood, S. C., a distance of 70 miles beyond Sievern, its present terminus. From Allendale the Charleston & Macon is to be built to some leading point, probably Macon, in Georgia. Another feeder for the road and city will be the Port Royal & Western Carolina lines, which are to be brought into close touch with the new system by a strong traffic agreement. This deal means much more than the mere building of the road to Allendale. The Port Royal & Augusta, the Port Royal & Western Carolina roads, owned by Messrs. Thomas & Ryan, and the Greenwood, Anderson & Western—with its extension now in course of construction, are to be consolidated with the new line. When the new system is completed it will own and operate together in the interest of Charleston over 600 miles of rails.

Tennessee.—A new road to run from Rugby, Tenn., on the Cincinnati, New Orleans & Texas Pacific to Butler's Landing on the Cumberland river—a little more than 50 miles—has recently been incorporated. It will run through Jamestown the county seat of Fentress county and one of the oldest settlements in Tennessee. At present this place is nearly 35 miles from the line of a railroad.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The 800 cars to be built for the Illinois Central have been awarded as follows: 500 coal cars to the Wells-French Co., and 300 refrigerator cars to the United States Rolling Co. These last named cars will be built at the Hegewich plant of the company.

—At a further test, made of the Baldwin-Westinghouse electric locomotive at the shops of the Westinghouse Air Brake Co., at Wilmerding, Pa., a speed of 45 miles an hour was developed, the engine being loaded with 25 freight cars. In the near future a public test of the engine will be made, to which a large number of railroad men will be invited. Railroad men everywhere are taking great interest in this locomotive, and since it has been at the shops of the Westinghouse Electric & Manufacturing Co., it is estimated that 500 officials have gone there to see it.

—The Kalamazoo Railroad Velocipede & Car Co. is just in receipt of an order for one of its two horse power gasoline motor inspection cars from Buenos Ayres, South America, to be built for 5 ft. 6 in. gage track. It is also in receipt of an order for three No. 6 24 in. gage, inspection velocipede cars from Calcutta, India.

Bridges.

—W. B. Worthen and others of Little Rock, Ark., has incorporated the Hartford Construction Co., with a capital stock of $250,000, for the purpose of constructing railroad bridges, etc.

—A new bridge is proposed across the Monongahela river to connect Glassport and Mendelssohn. The principal promotors are said to be the Pittsburgh, Virginia & Charleston R. and the United States Glass Co.

—The commissioners of Calvert, Texas, have granted an an appropriation of $13,000 for building another bridge across the Brazos river. The citizens of Calvert agree to pay 3,000 toward the work. It is said that the contract has already been awarded.

—The house committee on commerce has reported to congress a bill authorizing the Montgomery Bridge Co. to construct a bridge across the Alabama river.

—The commissioners or Mercer county, Pa., have decided on sites of bridges as follows: One of 26 ft. span in Pine township; one of 27 ft. span over Indian Run, in Wilmington township; one of 33 ft. span over McCullough Run, and one near Gilkey's, in Lackawannock township; one of 30 ft. span over Pine Run in Hickory township; one of 40 ft. span in Delaware township, near Hamburg; and two in Delaware and Sugar Grove townships.

—The Sharpsburg Bridge Co. is receiving bids for the erection of the new bridge, at Sharpsburg, Pa.

—The bridge to cross the Tennessee River at Knoxville, Tenn., and contract for which was placed with the Youngstown Bridge Co., Youngstown, Ohio, will be paved with cement paving and corrugated trough floor, which is being manufactured by the Youngstown Iron & Steel Roofing Co., Youngstown, O.

Buildings.

—The Southern Railway Co. and the Louisville & Nashville Railroad Co. will build a union depot at Middlesborough, Ky.

—The Ohio River road has prepared plans and secured ground for a new roundhouse and repair shops at Wheeling, W. Va.

—The depot and warehouse of the Yazoo & Mississippi Valley Railroad has been destroyed by fire. It is to be rebuilt.

—The contract for building the new union depot at Columbus has been let to the Guarantee Construction Co., of Chicago. The contract price is not made public, but it is understood that the structure will cost about $600,000.

—It is stated that a new union depot will be built in the near future to replace the one just burned at Fort Worth, Tex. L. S. Thorne, general manager Texas & Pacific Railroad, Dallas, Texas, can be addressed.

—A site has been selected for the new shops of the Pittsburgh & Western Railroad at Deforest Junction, two miles southeast of Warren, Ohio. The present shop equipment at Painesville, Ohio, will be removed to the new location, and it is expected the new plant will be ready for operation within 90 days.

—While nothing definite has as yet been announced regarding the rebuilding of the Queen & Crescent Route machine shops recently burned at Somerset, Ky., it is probable that larger shops than the old ones will be erected.

—The directors of the Missouri, Kansas & Texas Railroad have passsed a resolution ratifying the action of the board in March last, appropriating $100,000 to build a roundhouse at Denison, Texas, and improve West Denison yards.

—The Louisville & Nashville Railroad Co. has made a proposition to the city of Montgomery, Ala., for the erection ofa $300,000 depot.

Iron and Steel.

—The annual meeting of the stockholders of the Washburn-Moen Manufacturing Co., Worcester, Mass., was held on the 26th ult. About 20,000 shares of stock were represented. The election of officers resulted as follows: President, William E. Rice; vice president, general manager and treasurer, Philip W. Moen; directors, W. E. Rice, P. W. Moen, G. T. Dewey, Stephen Salisbury and Rockwood Hoar. The annual report showed a much better business than a year ago. The total output was 168,268 tons, an increase of 26,413 over last year, while the proceeds from sales amounted to $10,073,429, an increase of $1,640,000. The net earnings for the year amounted to $837,500. Four thousand four hundred and eighty people are employed by the company, the pay roll amounting to $35,000 a week. It was voted to increase the capital stock from $3,500,000 to $4,000,000.

—The Ritchey Iron & Steel Co. has been incorporated. Capital, $100,000, with headquarters at Ironton, Ohio. The incorporators are: D. S. Gray, W. W. Franklin, Chas. Parrott, D. E. Neereamer and I. D. Ross. The company was organized for the purpose o f purchasing or leasing a furnace or furnaces, or property on which to erect same.

—There has recently been rolled at the works of the Stockton Malleable Iron Co., Limited, Stockton-on-Tees, England, a steel plate weighing 5 tons 10 cwt., the sheared size being 76 ft. 3 in. by 5 ft. by 12-20 in. thick. The width before shearing varied from 6 ft. 2 in. to 5 ft. 2 in., and when finished the plate was without a flaw, and in every way up to Lloyd's requirements. This plate exceeds in size one attracting considerable attention at the Cardiff Exhibition and described as of greater length than any hitherto manufactured. The Cardiff plate is 69 ft. long, 4 ft. 2½ in wide, 12-20 in thick, and weighing 3 tons 13 cwts. It is the production of the Dowlais Iron Co., who propose to roll a still larger plate when the members of the North East Coast Institution of Shipbuilders and Engineers visit South Wales in the summer.

—Phillips & McLaren, of Pittsburgh, Pa., have just shipped a standard iron frame silica pan for a concern in Westmoreland county, and a sand plant in the same place, consisting of a crusher, washer and grinder. They are also doing the machine work on 60,000 lbs. of steel plates to be used in the construction of the Cincinnati and Covington bridge. Shipment was made a few days ago of a car load of castings for a clay works in New Jersey, and a bar shear for cutting 2½ x 2½ squares and rounds for a company in this district.

—The machinery for the new plant of the Keystone Axle Co., Beaver Falls, is being placed and everything will be in operation by July 1. The company expects to roll 200 axles a day. The axle is toughened by the Rowles process. The company's capitalization is $200,000.

Machinery and Tools.

—J. A. Fay & Co., the great manufacturers of wood working machinery, at Cincinnati, O., recently received a very large order from Yokohama, Japan. During the recent contest with the Chinese, the Japanese saw a large railroad shop fitted out by J. A. Fay & Co., many years ago. The Chinese had made very little use of it, but the Japanese, instead of taking the old plant down and transporting it to Japan, came to the United States and bought a somewhat similar though completer outfit for their government railroad shops. This is the largest order ever given by them for an outfit of wood working machinery and it has attracted much attention, as these shops are intended to be the finest in the east, if not in the world.

—The Q & C Company, prominent manufacturers of railway supplies and special machinery, Chicago, Ill., has received their award for very fine exhibit of metal sawing machinery and tie plates at the Atlanta Exposition. This award consists of a very fine, designed gold medal. The special meritorious features of the metal sawing machines offered by this company are that they are low in price, effective in service and economical in action, each machine sold by this company being provided with positive automatic feed, greatly reducing the time ordinarily required to cut metals of all kinds. Numerous testimonials as to the efficiency of these machines are being constantly received.

—Smith & Mills, manufacturers of shapers at Cincinnati, O., will build a three-story brick and iron structure, to cost $10,000, for the accommodation of the increase in their business.

—Mr. Henry L. Leach, of 176 Huron avenue, North Cambridge, Mass., writes that he is receiving many orders for track sanding apparatus for locomotives and that the number received in May of this year amounted to equipments for 129 locomotives, which is evidence of the satisfactory results which have been found with this apparatus. This is the best record yet made for any one month.

—The C. H. Haeseler Co., of 1001 Hamilton street, Philadelphia, has recently been incorporated and is located on the upper floors of the Pedrick & Ayer building. Mr. Haeseler, the president of the company, is the well known inventor of a number of special tools, many of them pneumatic. This company will make a specialty of air tools for many purposes, and has recently acquired control of the patent rights of the Keller pneumatic hammer. Among the other special tools are the Phoenix portable power drills, sand sifters, crane motors, hoists, reamers and tappers, calkers and chippers. The company already enjoys a good business, having recently made some heavy foreign shipments.

—The Chicago Pneumatic Tool Co., 1020 Monadnock block, Chicago, manufacturers of pneumatic hammers, has just received a cable order from London for ten more of its "B" size hammers. This company has also just succeeded in operating one of its pneumatic hammers under 90 feet of water in the East River, New York, in calking water pipes. The work is done by divers, and has heretofore been accomplished by the use of hand hammers, at a very slow rate and heavy expense.

Miscellaneous.

—The A. French Spring Co. has removed its Chicago office from 408 Western Union Building to 1414 Fisher Building.

—John F. Dickson and W. G. Sears and others, of Houston, Tex., have incorporated the Southern Transportation Co., with a capital stock of $250,000; purpose to operate steamship lines, erect wharfs, warehouses, etc.

—A feature of the new factory building for the Norton Emery Wheel Co., Worcester, Mass., is the mammoth kiln, just completed. In this kiln 60,000 brick were used. The outside diameter at the base is 25 ft., inside measurement 18 ft., and the extreme hight 45 ft. The kiln has nine fire places and a total of 50 flues. The price list value of the goods that will be fired in the kiln at a single burning is $18,000. A new feature embodied in this kiln is an open space that completely encircles it and is similar in principle to that on a kerosene lamp. This circle secures, it is claimed, an even diffusion of heat. The contract for the foundation of the company's new factory has been awarded and already a portion of the walls is in position.

—Congress has recently authorized the commissioners of the District of Columbia to permit pipes to be laid through certain streets of Washington, D. C., for the purpose of supplying Pintsch gas to the Baltimore & Ohio, Baltimore & Potomac and Southern Railway depots, as well as for charging the illuminated buoys used in the Potomac river. Senator McMillan, in reporting the bill on behalf of the committee of the District of Columbia, alluded to the project as follows: "Pintsch gas is used for lighting railway cars and buoys. The object to be gained is the lighting of the railway mail cars starting from Washington, thus doing away with the oil lamps, so dangerous in railway mail cars especially; also the furnishing of gas for lighted buoys on the Potomac. The Pintsch gas is in use all over the country, and there is no experiment in the matter. Indeed, the bill simply provides for a commercial necessity."

—The Trojan Car Coupler Co., of Troy, N. Y., is, of course, much gratified at the clear-cut decision of the court of appeals in its favor, which was published in full in the RAILWAY REVIEW of May 30, and its effect is already felt in its business. This company is very busy, having lately received some very satisfactory orders. Among these is one for a large number of cars of the Louisville, New Albany & Chicago Railroad, which company proposes hereafter to use the "Trojan" on all its cars not equipped with modern couplers, also new cars. The Trojan Co. will be well represented at the Saratoga conventions.